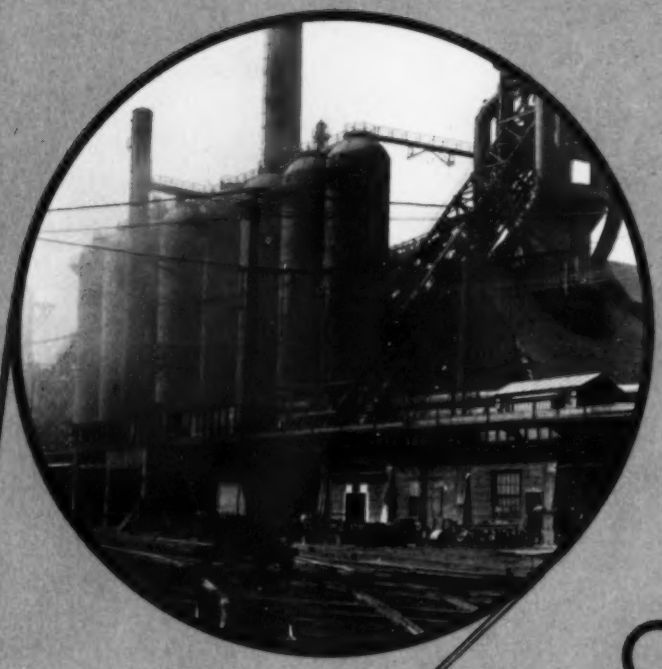
# PUBLIC HEALTH REPORTS

*In this issue*

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service



# Occupationa Health

# PUBLIC HEALTH REPORTS

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# PUBLIC HEALTH REPORTS





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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE
LEROY E. BURNEY, *Surgeon General*

*The effort to define and standardize terms and categories used in morbidity statistics has produced intense discussion and a few distinct differences among biometricians. Dr. Dorn's contribution to this discussion indicates some of the issues that lie in the way of general agreement.*

# A Classification System for Morbidity Concepts

HAROLD F. DORN, Ph.D.

THE LOW DEATH RATE in most of the countries of Europe, North America, and Oceania, and in certain countries in other parts of the world greatly limits the usefulness of mortality statistics as a measure of the amount and characteristics of ill health of the population of these countries. The recognition of this fact has stimulated interest in the collection and analysis of a variety of morbidity statistics.

Although morbidity statistics for insured populations and for members of sick benefit associations date from the last century, corresponding statistics for the general population are of much more recent origin. General morbidity surveys of selected areas of a country or of special population groups were made as long as 40 years ago, but efforts to collect general morbidity data for the entire population of a country date from about 1940.

The publication of the findings of general morbidity surveys has made clear that there is no consensus concerning terms used to describe and measure morbidity. This is not surprising since agreement on terminology is not easy to achieve. It is a sound principle that attempts to reach agreement on the definition of standard terms should be preceded by a period of use of a variety of terms so that the adoption of a standard terminology may be based upon the demonstrated utility of the preferred terms.

The statistical description and measurement of morbidity is more complex than that of mortality. In addition, experience in the use of different terms is still rather limited so that it is doubtful if the time is ripe for an attempt to reach agreement upon a list of standard morbidity terms for use on a national basis. Nevertheless, it would be advantageous to encourage discussion of the types of terms required in the description and measurement of morbidity and also to propose the use of some terms on a trial basis in order to bring about the consensus requisite to agreement upon a standard terminology.

A large number of terms to describe the different aspects of ill health and to measure the risk of becoming ill, the amount of ill health in a population, or the amount of disability due to ill health already exist. If these existing terms are to be organized into an orderly system, it is essential first to develop a general scheme for classifying and enumerating the

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unit or units of observation in morbidity studies. This paper proposes such a general scheme.

It is necessary to use certain terms in order to continue with this discussion. These should not be regarded as necessarily being preferred terms; they are used only for the purpose of facilitating this discussion. Once a general scheme is outlined, the definition of the various concepts involved can be considered.

A period of ill health is a continuous interval of time during which a person experiences a departure from a state of good health. This also has been called a spell or episode of ill health or a complaint period.

During a period of ill health, one or more separate diagnostic entities or causes of ill health may exist. These will be called illnesses or diagnoses with the understanding that illness includes conditions resulting from disease, poisoning, and injury.

The amount of ill health in a population may be measured by (*a*) the number of persons who are ill, (*b*) the number of periods of ill health, or (*c*) the number of separate illnesses or diagnoses. During a fixed interval of time one person may experience one or more periods of ill health with one or more illnesses during each period. Consequently, it is important to be clear as to which unit of measurement is being used since the definition and method of computation of morbidity rates is not the same for each unit.

For the purpose of measuring morbidity, ill health may be classified (*a*) with respect to the interval of time during which observations are made, and (*b*) from the point of view of the person affected.

If we observe a population during a specified interval of time, four categories of ill health may be observed. For convenience in exposition the term "case" will be used to denote the manifestation of ill health being observed and may refer to a person, a period of ill health, or an illness.

1. Cases existing prior to the start of the interval, continuing throughout the interval, and still existing at the end of the interval.

2. Cases existing prior to the start of the interval and terminating during the interval.

3. Cases beginning during the interval and still existing at the end of the interval.

4. Cases beginning during the interval and terminating during the interval.

Since the term "case" is here used in a general sense, category 4, for example, may be interpreted as (*a*) the number of persons becoming ill and recovering during the interval, $t_1$ to $t_2$, or (*b*) the number of periods of ill health beginning and terminating during the interval, $t_1$ to $t_2$, or (*c*) the number of separate illnesses beginning and terminating during the interval, $t_1$ to $t_2$. In general, these three numbers will not be the same.

This classification suggests three ways of counting cases in relation to time.

1. The number of cases existing at some point of time, for example at $t_1$. This would include categories 1 and 2 shown in diagram 1. In practice, this may be defined as the number of cases existing during a single day or as the average daily number of cases existing during the interval $t_1$ to $t_2$.

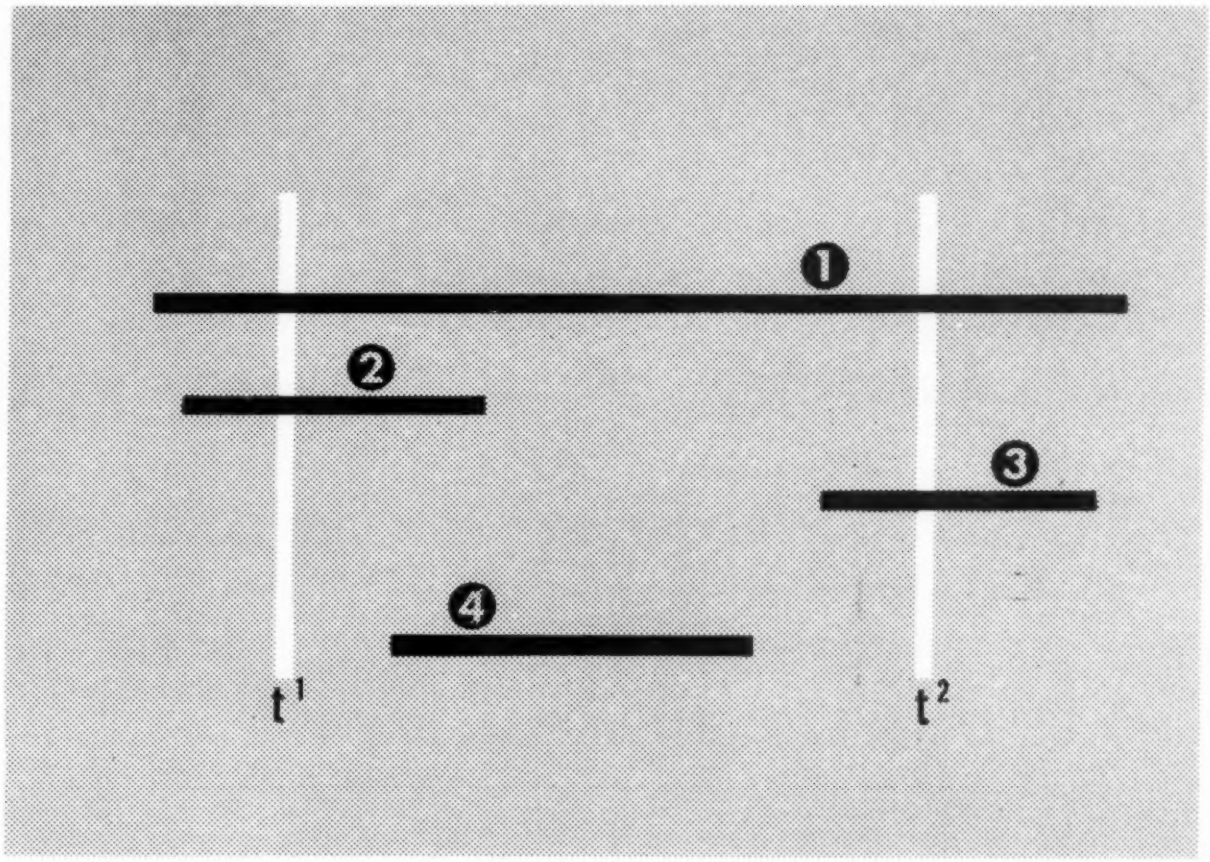
2. The number of cases existing at any time during the interval, $t_1$ to $t_2$. This is an index of the total amount of illness during the interval and would include a count of all four categories of cases shown in diagram 1.

3. The number of cases with onset during a specified interval of time, for example, between $t_1$ and $t_2$. This would include categories 3 and 4 shown in the diagram.

The relationship between the three units in which cases of ill health may be enumerated can be seen from the following classification of ill health from the point of view of the person affected (diagram 2).

During a specified interval of time a person may experience (*a*) no period of ill health, or (*b*) a single period of ill health, or (*c*) two or more periods of ill health. During each period of ill health one or more distinct illnesses or diagnoses may exist. Each illness may be (*a*) the first attack during the person's lifetime, or (*b*) the first attack during the period of ill health, or (*c*) the second or subsequent attack during the period. For the second and subsequent periods of ill health during the interval of observation, a specific illness may be classified as to whether or not it is the first attack during this interval.

Diagram 1.




First attacks may be illnesses (*a*) for which one attack gives lifelong immunity, for example, smallpox or measles; or (*b*) from which complete recovery may occur but no immunity from subsequent attacks exists, for example, the common cold or pneumonia; or (*c*) with a persistent residual pathological process characterized by alternating periods of remission of symptoms and clinical manifestation of ill health. Most chronic diseases such as bronchitis, asthma, and arthritis fall into this last category. Included also are illnesses for which even temporary remission of symptoms does not occur. This classification of first attacks applies equally to all subsequent attacks of illness except for the class of illnesses that give lifelong immunity after one attack.

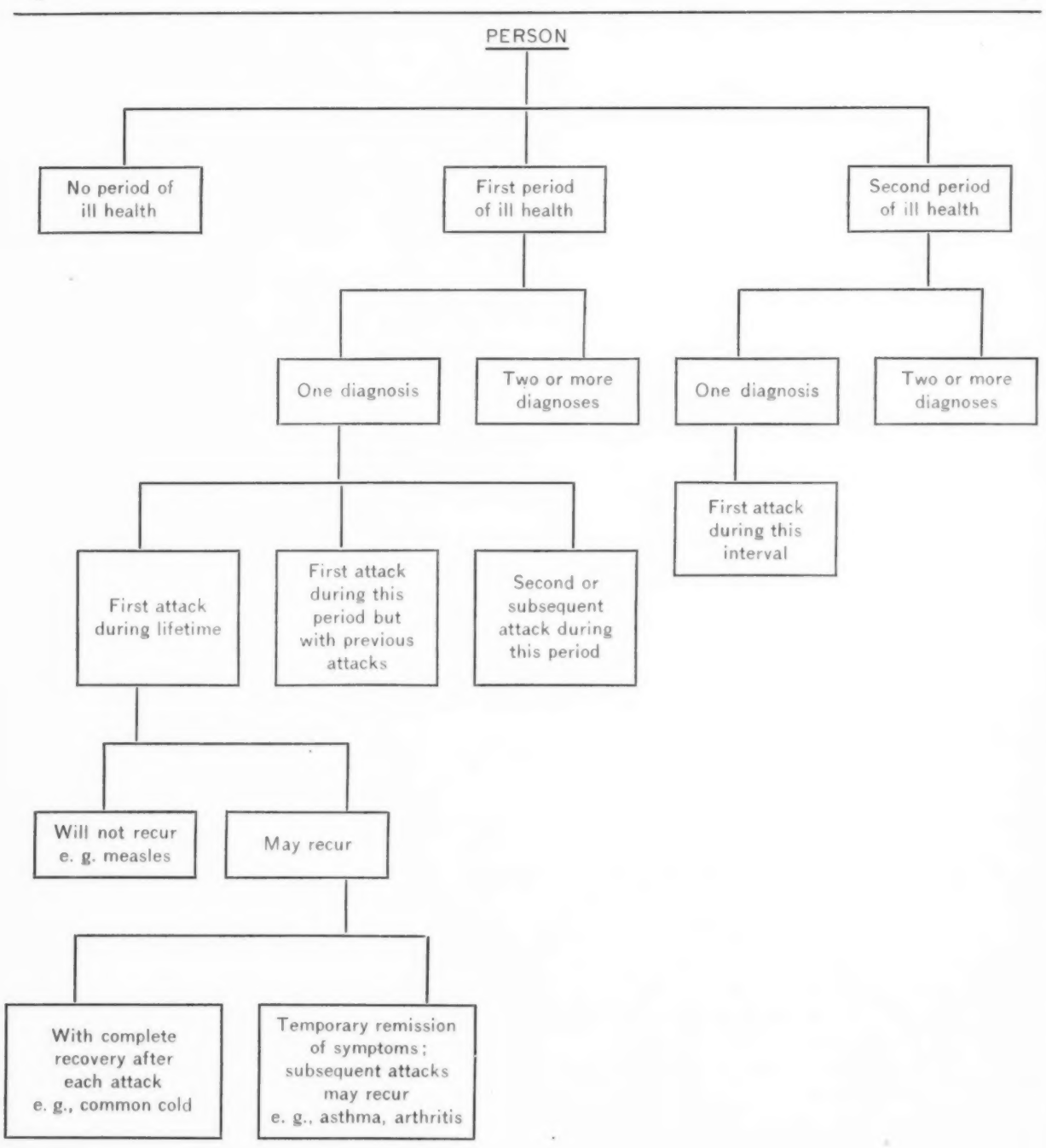
Three ways of counting cases of ill health with respect to time were mentioned above: (*a*) the number of cases existing at some point in time, (*b*) the number of cases existing at any time during an interval of time, and (*c*) the number of cases with onset during some interval of time. The first two ways result in measures of the amount of ill health in a population and the third way results in a measure of the risk of ill health or of the rate at which ill health develops in a population.

Rates computed from the first two ways of counting cases may be termed prevalence rates of ill health. They measure (*a*) the amount of ill health at a particular point of time, in practice usually a given day, that is, point prevalence; or (*b*) the amount of ill health during a specified interval of time, a month or a year—period prevalence.

Prevalence rates may be based upon a count of persons who are ill, a count of periods of ill health, or a count of illnesses. For a prevalence rate at a particular point of time, the number of ill persons and the number of periods of ill health is the same. However, the number of illnesses or diagnoses may be greater than the number of ill persons.

A prevalence rate for an interval of time, $t_1$ to $t_2$, is based on a count of cases existing at $t_1$ plus all cases beginning during the interval, $t_1$ to $t_2$. In this instance the prevalence rate for persons usually will be less than that for periods of ill health which in turn will be less than that for illnesses or diagnoses. A useful special form of a prevalence rate during an interval, $t_1$ to $t_2$, is the proportion of a population which is ill, computed as a daily average for the interval. In this form, it is often called the daily noneffective rate and shows the proportion of a population which is ill on an average day.

**Diagram 2.**



A rate computed from the third way of counting cases with respect to time, that is from a count of cases beginning during an interval, may be termed an incidence rate. This is a measure of the risk of becoming ill or of the rate at which ill health develops. It may be computed for persons, periods of ill health, or for illnesses. The method of computation and interpretation is, of course, different in each instance.

An incidence rate for persons represents the proportion of the population that is ill at least once during the interval $t_1$ to $t_2$. An incidence rate for periods of ill health represents, per unit of population, the number of separate periods of ill health developing during the interval, $t_1$ to $t_2$. The magnitude of this rate may exceed that of the unit of population on which the rate is based. For example, a rate per head may be greater than unity.

Before an incidence rate for illnesses can be computed, it is necessary to decide which of the types of illnesses shown in diagram 2 are to be used. Illnesses that give lifelong immunity after one attack present no special problem. Illnesses from which complete recovery is possible may be counted the first time they occur in each period of ill health. A person with two or more periods of ill health may have two or more common colds during an interval of observation. A second attack of the same illness during a single period of ill health creates a more difficult problem, for it is necessary to decide whether the second attack is merely a prolongation of the first or is a new attack of the same disease and hence should be counted in the computation of an incidence rate.

The greatest problem is created by some of the so-called chronic illnesses that are characterized by alternating periods of active clinical manifestation of ill health and lack of symptoms. Asthma, bronchitis, arthritis, and migraine are examples of this class of illnesses. A count of attacks of these illnesses can be based upon (*a*) the first attack during a lifetime, or (*b*) the first attack during the interval, $t_1$ to $t_2$, or (*c*) the first attack during a period of ill health, or (*d*) each separate attack during a period of ill health. Obviously the magnitude and interpretation of the incidence rates based on these methods of counting cases will differ greatly.

Incidence and prevalence rates belong to a class of rates designed to measure the frequency of ill health. Although certain incidence and prevalence rates, namely, those based on persons sick one or more times, taken as a unit or on first attacks of illness, may be interpreted as relative frequencies with a maximum value of unity and hence may be considered to be a measure of the probability of ill health, the remaining rates are in reality weighted averages and may exceed unity when expressed per head of population.

A second class of rates are those designed to measure disability. These yield the average number of days of disability (*a*) per person, (*b*) per period of ill health, or (*c*) per illness. The usual method of computation is to divide the number of days of disability during a specified interval, $t_1$ to $t_2$, by the appropriate denominator and express the quotient on a per annum basis. If the rate is for persons, the appropriate denominator would be the average number of persons in the population during the interval. There are advantages in counting only days of disability occurring within the interval, $t_1$ to $t_2$, for persons who are ill at the beginning of the interval. This rate yields the average number of days of disability per person per annum or some other unit of time.

If the rate based on persons is expressed per day, it is often called the daily noneffective rate since it is the average proportion of persons who are disabled on a given day during the interval, $t_1$ to $t_2$. This results from the fact that a day of disability is equivalent to one person disabled for 1 day. The daily disability or noneffective rate also is an average daily prevalence rate.

The computation of the average number of days of disability per illness creates knotty problems in the determination of the number of days of disability to assign to two or more illnesses occurring during the same period of ill health.

The amount of disability due to a period of ill health may be computed by dividing the total number of days of disability during the interval, $t_1$ to $t_2$, by the number of periods of

ill health during the interval. For periods that begin before the interval of observation, only the days of disability during the interval are counted. Similarly for periods not terminated at the end of the interval, only the days of disability during the interval are counted.

This definition leads to an interesting relationship between frequency and disability rates when the frequency rate is defined as the number of periods of ill health existing during the interval divided by the average number of persons in the population with the quotient expressed per head. Then, if $F$ represents the frequency rate, $D$ the disability rate per person, and $S$ the disability rate per period, $F \times S = D$; or $F = D/S$.

Another special relationship exists if the frequency rate is defined as in the previous paragraph and expressed per person per day, that is, as a daily rate per person, and the disability rate is computed for persons and expressed as an average daily prevalence rate or noneffective rate per person. Then from the relationship between $F$, $S$, and $D$ shown above, we have $F = D/S$, or

$$\text{daily morbidity rate} = \frac{\text{daily noneffective rate}}{\text{average number of days of disability per period of ill health}}$$

If the daily morbidity rate is 1 per 1,000, the daily noneffective rate, that is, the proportion of the population ill on an average day, equals the average number of days of disability per period of ill health. For example, if the daily hospital admission rate is 1 per 1,000, the proportion of the population in hospitals on an average day is equal to the average duration of stay in hospitals.

In general the above relationships between frequency and disability rates hold true only in a population with a fixed pattern of ill health. A further discussion of this point is beyond the scope of this paper.

Some persons have computed the measure of disability as the average duration of periods of ill health ending during the interval of observation, $t_1$ to $t_2$. This necessitates counting the days of disability occurring before time, $t_1$, for periods of ill health existing at $t_1$. There is no reason why this method of computation should not be used provided the result is useful. However, if this is done, the above relationships between $F$, $D$, and $S$ no longer hold true. Furthermore, although this method of computation gives the correct duration of cases terminating during the interval, $t_1$ to $t_2$, this is not necessarily the same as the eventual duration of cases still ill at the end of the interval except for a population with a fixed pattern of ill health.

The above discussion is only an introduction to concepts useful in general morbidity statistics of a population. Terms useful for special morbidity statistics, such as hospital statistics and insurance statistics, have not been considered. The purpose of this discussion is to clarify some of the basic concepts useful in the description and measurement of morbidity in order to provide a basis for the development of widely acceptable definitions for specific terms.

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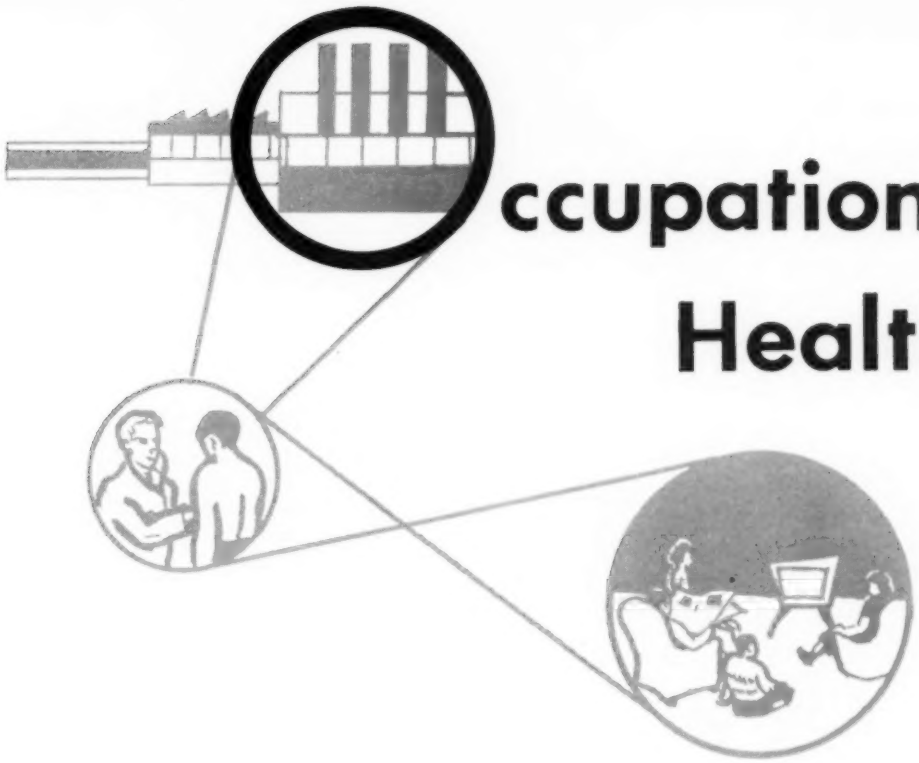

# Occupational Health

## Health, Production, and Morale

Few enterprises in the economy of public health are as dynamic and protean as those broadly categorized as occupational health. The intense concern with this work is reflected in the numbers who turn out for the occupational health sessions at most public health conferences.

Far beyond a nearsighted concentration on specific toxins, particle concentrations, decibels, or safety boots, occupational health has extended its vision to place specialized hazards within the frame of total health needs. The most effective occupational health work is found to concern itself with the general health of each employee. Efforts directed in the past at reducing losses and claims related to accidents and occupational injuries are being directed more at maintaining productivity and morale in the working force.

The changed concept of occupational health is evident in the 1955 decision of the American Medical Association that physicians qualifying should be certified by the Board of Preventive Medicine as diplomates in occupational medicine, a subspecialty of preventive medicine.

The dominance of preventive over surgical aspects of this work is another indication of the evolutionary trend. It is brought about by a combination of advances in the skill of medical service, by the experience and wisdom of management, and by the tendency of labor to seek services rather than wage gains which are dissipated by leaps in living costs.

The present issue of *Public Health Reports* carries an extra large portion of papers on occupational health for the purpose of directing attention to some of the possibilities in this important, growing, and swiftly changing aspect of the public health profession.

—HAROLD J. MAGNUSON, M.D., *chief, Occupational Health Program, Public Health Service.*

Occupational Health

# Small Plant Health Services and the Health Officer

JOSEPH H. GERBER, M.D., Dr.P.H.

THE PROGRESS made in occupational health in the past 50 years has been tremendous. Services that started out to provide traumatic surgery alone now encompass such elements as preplacement, periodic and return-from-illness examinations, treatment of occupational illnesses and injuries, emergency treatment of nonoccupational conditions followed by referral to family physicians for definitive care, health counseling and education, the prevention and control of job-related environmental health and safety hazards, and proper recordkeeping with the provision for confidentiality of personal health files. Through the application of the principles of preventive medicine and public health, we are now in a position to prevent illness, disease, and disability and to maintain optimal health of employed persons.

In addition to the emphasis now being placed on prevention, a most significant development in this field is management's growing recognition of its obligations to provide a safe working environment and its opportunity to promote better health for workers. This attitude is more than the response to a humanitarian impulse. Experience has shown that occupational health programs, properly organized and conducted, lead to reduced absenteeism from sickness, improved employee morale, increased productivity, decreased personnel turnover, and lowered compensation-insurance rates.

And yet, despite this notable progress, the fact is that occupational health services are at present available to comparatively few workers. Particularly lacking are services to employees of small plants—those with fewer than 500 employees. Seventy percent of all workers are employed in plants of this size. Less than 5 percent of these employees have available to them any type of inplant, on-the-job medical services. This situation is and should be of concern to all public health workers.

To what can we ascribe the relatively slow acceptance, especially by small plants, of programs so mutually beneficial? Three main reasons can be cited:

- Lack of appreciation (and perhaps knowledge) by management of the many benefits and advantages to employer as well as employee.
- Belief on the part of management that costs of such programs are excessive.
- Difficulty in obtaining advice and assistance in developing such services.

What can the health officer do to rectify this situation? By adding to his own knowledge of local factors an acquaintance with the efforts being made elsewhere to provide health services for small plant workers, the health officer can choose the approach—or approaches—that might best succeed in his community and then attempt to stimulate appropriate action.

## Practical Programs

Experience offers a variety of practical methods for providing health services to employees of small establishments. Here are five of such programs which have seen successful operation.

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Part-time inplant medical services have been sponsored cooperatively by managements of several companies in a community. Typical programs are the Hartford (Conn.) Small Plant Group Medical Service and the New Haven (Conn.) Small Plant Medical Program, which have been operating 11 and 3 years respectively. Organization of the Hartford group was spurred on and the program continues to be supported by an official of one of the member companies. In New Haven the chamber of commerce took the initiative. In both communities, the bureau of industrial hygiene of the Connecticut State Department of Health has lent its active support and guidance.

In both programs one full-time physician is employed by the member companies, each of which maintains its own dispensary and full-time or part-time nurses. The physician visits each plant at a scheduled time and is available for emergencies at all times. Each member company designates one employee as "coordinator" with responsibility for the program's administration in his company. At least once a year the coordinators from all member companies meet to transact joint business.

Experience in these two communities indicates that this type of program works well when some one person in the community is actively interested in the program, the chosen physician is "dedicated," and there are health facilities and personnel in each plant readily available to the employees.

Union health centers provide varying health services for their own members. An increasing number of such centers are now providing services to members of other unions in the community or are being organized jointly by two or more unions. The services include definitive medical care and, increasingly, preventive services. Many centers also serve families of members.

Individual physicians or groups of physicians themselves have provided part-time, inplant medical services. Some physicians are limiting their practices to industrial medicine and serving a number of plants. In such cases they usually visit the plants and are concerned with on-the-job environmental conditions as well as with provision of emergency care and physical examinations. In many instances, however, the physician is "on call" for emergency care only. Plants with this type of program may or may not employ nursing personnel or contract with a visiting nurse association for inplant service.

It is estimated that more than 25,000 physicians are doing industrial medical work—5,000 full time, 10,000 part time, and another 10,000 on call. But only 164 of these have been certified in occupational medicine by the American Board of Preventive Medicine, and only 3,400 are members of the Industrial Medical Association.

Mobile clinics have been established in a number of communities under various auspices. Nonprofit organizations have been established to operate such clinics in at least two communities (Birmingham, Ala., and Atlanta, Ga.) with the support and guidance of health department personnel. In Asheville, N. C., the privately owned and operated Occupational Health Service has several mobile units which provide comprehensive physical examinations at the plant site, with the necessary adjunctive laboratory and X-ray studies. A number of the locals of the International Ladies Garment Workers Union are using mobile units to provide examinations for their members near or at their place of work.

Insurance companies have assisted many establishments in developing occupational health programs. The varying types of such assistance have included the provision of inplant nursing services.

### Role of the Health Department

Health department interest in the promotion of occupational health services has been largely confined to the activities of approximately 40 States and 20 local health departments which have special units for this purpose. A recent count, including the three State labor department programs in Illinois, Massachusetts, and New York, reveals that a total of 355 employees are engaged specifically in occupational health activities. It is significant, however, that 289 of these are engineers, chemists, physicists, or other nonmedical workers, while only 31 are nurses and 26 are physicians. It may be concluded, therefore, that in some of the State and

local occupational health programs there is underemphasis of preventive medical aspects.

It has been said many times before and should be repeated and repeated again—health on the job is and must be related to health away from the job. This seems obvious enough, but it is amazing how often this interrelation is disregarded. It is important for those planning occupational health programs to do so with an understanding of community health activities and an appreciation that integration of the two is the essential program ingredient. The current emphasis on prevention and early diagnosis of long-term illnesses makes more apparent than ever the need for concurrence in approach and operation of all health programs.

It appears obvious that the health department, of all community health agencies, is best equipped to provide this holistic approach. Is it not timely for health officers to take a fresh look at their occupational health activities, particularly from the viewpoint of relating them to their other program activities? It is possible that a health department's consideration of these questions may reveal activities that need strengthening, areas that need exploration:

- What information have we about the size, number, and kinds of industrial and business establishments in this community?
- How many of them have occupational health programs? Which elements of a comprehensive program are being neglected?
- What services does this health department now provide to industrial and business establishments? Are our nurses, sanitarians, nutrition consultants, and health educators visiting them?
- Are the accident programs in plants adequate? Are toxic agents well controlled? Are health department services in these areas being utilized? What additional services are required? Should we provide them? What services and information are available through other official sources—State labor departments and workmen's compensation agencies, for instance?
- What services are voluntary agencies providing to industrial establishments?
- Is the health department providing chest X-ray and serology services to plant health programs?
- Have we conducted any surveys—diabetes, glaucoma, tuberculosis, syphilis—among employees?
- What more can the health department together with the medical society, the chamber of commerce, the trade associations, unions, and other voluntary agencies do to assist establishments in organizing effective occupational health programs?
- Are we setting a good example by providing the services of a good occupational health program for State and local government employees?

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# Workers' Compensation and the Physician

THEODORE C. WATERS, LL.B.

WORKMEN'S compensation laws have been enacted in all States and Territories of the United States. With the passage of the Longshoremen's and Harbor Workers' Compensation Act in 1927 and the Federal Employees' Compensation Act in 1908, they have been extended to all Federal jurisdictions and positions, including the District of Columbia.

Prior to the enactment of such legislation, an employee had a common law right of action against his employer for injuries arising out of and in the course of employment, dependent upon proof of his employer's negligence. Therefore, the common law recognized and enforced the liability of an employer for injuries to his employees caused by the employer's negligence. That rule, however, became qualified by the legal recognition of common law defenses of the employer, which were the employee's assumption of risk, the employee's contributory negligence, and the negligence of the employee's fellow workers.

The enactment of workmen's compensation laws imposed upon the employer liability for those injuries arising out of and in the course of employment that were made compensable by the statute. They deprived the employer of his common law defenses and also deprived the employee of his right of common law action for such injuries, limiting the amount of compensation payable to the injured employee but assuring him of weekly benefits payable over a fixed period of time.

The laws of the several States, the Longshoremen's and Harbor Workers' Act, and the Federal Employees' Act are not uniform with respect to their provisions. Some provide compulsory insurance, while some provide elective insurance. Most laws grant certain exemptions based upon the number of employees. Some exclude farm workers from the benefits provided by the law. Some provide compensation for all occupational disease; others limit compensation to scheduled diseases. These laws vary with respect to the waiting period between the date of injury and the date for the beginning of payment of compensation. Length of time and amount of payment of benefits vary for temporary total disability, permanent partial disability, permanent total disability, and death (*1,2*).

The original acts contemplated coverage for accidental injuries, that is, for trauma occurring at a specific time and at a specific place while the worker was in the employ of a specific employer. By judicial construction and legislative amendments, these statutes have been gradually extended to cover occupational diseases. But what is an occupational disease? While the term has been the subject of many definitions, the basic concept is that it is a disease characteristic of and peculiar to a given employment. The fact remains, however, that many diseases of human life that may be contracted by the employee in his employment have been the subject of awards of compensa-

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tion under these statutes. The trend of commission and court decision has been liberal in favor of a given claimant; in practice the burden of proof rests upon the employer and insurer to prove that the disease or injury did not arise out of and during the course of employment or is otherwise compensable under the statute.

### "Injury"

Again, there is concern as to the legal concept of the term "injury." The following quotations from judicial decisions are indicative of legal construction of that term:

"'Injury' as used in Workmen's Compensation Act and as applied to a human being, includes whatever change in any part of the system which produces harm or pain, or lessens the facility of natural use of any bodily activity or capability." *McLean's* case, 93 N. E. 2d 233, 234, 326 Mass. 72.

"In common speech the word 'injury' as applied to a personal injury to a human being, includes whatever lesion or change in any part of the system produces harm or pain or a lessened facility of the natural use of any bodily activity or capability." *Furlong* v. *O'Hearne*, D. C., Md., 144 F. Supp. 266, 270.

"Acceleration, aggravation, or lighting up of preexisting disease as a result of employment is 'injury' for which full compensation is recoverable for entire disability suffered." *Tanenbaum* v. *Industrial Accident Commission*, 52 P. 2d 215, 216, 152 Oreg. 205.

"An employee, helping to erect a stone crusher, made several trips in carrying water in buckets, and then undertook to carry, from a wagon to a car, bags of coal each weighing approximately 150 to 200 pounds. The first to be taken was handed to him and carried to the car. The next bag was rested by the passer on the rim of the wagon wheel. The employee reached to take it from the wheel, and a minute later he was lying on the ground in a dying condition. The medical examiner testified that the employee's heart muscle was tired and exhausted at the time of his last work, and that his final exertions caused the inability of the heart to perform its work. Testimony of two physicians justified this assumption. Held to sustain a finding that the death of the employee was caused by 'injury,' within the Workmen's Compensation Act." *In re Fisher*, 108 N. E. 361, 220 Mass. 581.

Summarizing the legal construction of this term, it may be said that our courts generally construe the term to mean "harm to any part of the body."

### "Disability"

For the legal concept of the term "disability," we again find different definitions. The admitted purpose of compensation statutes is to propose an amount of compensation to be payable in terms of a percentage of the loss of wage. This is peculiar to all of our statutes and follows the pattern of the laws adopted by the British House of Commons, which form the precedent of the adoption of our laws (*3*). Therefore, in the administration of the laws originally enacted in this country the basic purpose was to relate compensation for disability arising out of and in the course of employment to the wages earned by the employee during that employment. The trend of our commissions, legislators, and courts has been to differ from that concept, and today we find three distinct concepts of the term "disability" recognized in different States:

1. Inability to earn full wages.
2. Total inability to perform any other work.
3. Actual incapacitation of an employee from performance of his work in the last occupation in which he was engaged.

There is a growing tendency on the part of administrative agencies to divert from the principle of awarding compensation based on loss of wages, and to compensate for injury irrespective of wage loss. In certain States, appellate procedure provides for jury trials, and the tendency to corstrue compensation claims as damage cases has developed.

Illustrative of this point, we find the following concepts of "disability" in court decisions:

"The word 'disability,' as used in Workmen's Compensation Law, means impairment of earning capacity, and not loss of a member, and is that which disqualifies an employee from doing work in whole or in part." Comp. St. 1929, Sections 48–101 et seq., as amended. *Wilson* v.

*Brown-McDonald Co.*, Neb., 278 N. W. 254, 261, 116 A. L. R. 702.

" 'Disability' may result as well from the condition of the mind and nerves as from other causes, and where a man is so inattentive or forgetful as a result of mental disorder that he cannot be trusted to carry on even simple forms of work he is as 'disabled from earning a livelihood' as one who must refrain from work on account of the condition of his vital organs." *United States* v. *Taylor*, C.C.A.N.C., 110 F. 2d 132, 134.

" 'Disability' within Compensation Act occurs when employee is disabled from rendering further service by present physical inability to perform work in usual and customary way, and in absence of such disability, employee sustains no compensable injury though employment may have subjected him to exposure which contributed to ultimate disability from occupational disease." St. 1931, Sections 102.01, 102.03 (1) (a). *North End Foundry Co.* v. *Industrial Commission*, 258 N. W. 439, 217 Wis. 363.

"The test of 'disability' under the Louisiana Workmen's Compensation Act is whether employee can do same type of work he was doing at time of his accident in the customary way without an unusual difficulty or pain." *Strickland* v. *W. Horace Williams Co.*, C. A. La. 230 F. 2d 793, 797.

One of the sequels to these changing concepts of disability is the adjudication of claims for compensation as claims for damages, and, until this trend is reversed, the potential of claims arising under our workmen's compensation statutes will be staggering. The result of this tendency is to administer our workmen's compensation statutes as health insurance statutes. Certainly this was not the original purpose of the enactment of such statutes. If that objective is socially desirable, it would seem proper to amend the laws, changing the designation from workmen's compensation laws to health insurance laws.

## Role of Industrial Physician

Generally speaking, industrial medicine has been something of a stepchild of the medical profession. Doctors eminently qualified in particular phases of medicine have been and are reluctant to become involved in any controverted case where a lawsuit or compensation claim arises. Most doctors do not wish to appear as witnesses in court or commission hearings. They resent legal cross-examination and the controversion of their opinions by other members of their own profession.

The basic issues in compensation claims are twofold:

1. Whether or not the claimant sustained injury arising out of or in the course of employment.

2. The nature and extent of disability.

The second issue involves the determination of medical questions. Either side is permitted to offer such medical testimony in support of its claim as the litigant deems proper or necessary. Frequently, conflicting testimony is presented. For example, Dr. A, in support of the claim, may take the unqualified position that employment and injury were related; Dr. B, controverting that opinion, may be just as firm in his opinion that there was no such causal relationship.

What can be done to evaluate properly such medical testimony? As illustrative of the role that industrial medicine may play in this matter, consideration is given to heart disease and the pneumoconioses, which may occur during employment.

### *Problems in Heart Cases*

In the trial of causes involving heart cases, three medical questions frequently arise:

1. Was trauma a factor in the heart attack?

2. Is there a direct causal relationship between employment and the heart attack that may be sustained by claimant?

3. Has employment contributed to the aggravation of an existing heart condition?

In the light of present medical knowledge, there are insufficient data for the proper evaluation of all heart cases.

As to the first question, where trauma is immediately and directly related to the heart attack, there should not be any question as to the compensability of the claim.

As to the second and third questions, authoritative criteria have not been accepted to determine whether there is a direct causal relation

between employment and a heart attack, or whether employment has contributed to the aggravation of an existing heart condition. With respect to these questions, courts and compensation commissions are perplexed in their attempts to administer justice when confronted with conflicting medical opinions. As indicative of these problems, reference is made to papers presented by Brig. Gen. Thomas W. Mattingly, now chief of the Department of Medicine at Walter Reed Army Hospital, and Dr. Richard J. Clark, member of the Rehabilitation Committee of the American Heart Association (*4*). Summarizing his discussion of the pathogenesis of heart disease, General Mattingly made the following statement:

"When the exact cause of heart disease is known, there are few occasions where the cause can be directly related to work in general or to a specific occupation. In many instances where the exact cause of heart disease is not known, there has been much speculation as to this relationship and many unjust and conflicting medical opinions and legal decisions may have resulted.

"The natural course of heart diseases has been stressed in the hope that it will provide a better understanding of the problem of aggravation of preexisting heart disease. This appears to be a major obstacle in appropriate employment of the known cardiac patient as well as adjudication of claims arising from his subsequent disability and death. It is believed that a more appropriate, workable, and equitable system should be evolved for the solution of this problem than that provided by the Workmen's Compensation Act and Associations of Industrial Accident Boards and Commissions. This will be necessary before the economy and health of any nation and its unfortunate cardiac inhabitants can profit by suitable employment."

Dr. Clark, who participated in the panel discussion, made the following statements:

"First, what types of cardiac death or disability may be clearly and completely related to work? Penetrating wounds of the heart, incurred in the course of employment, leave no room for debate. When there is nonpenetrating injury to the chest, which is followed within a few hours by disability and clear-cut electrocardiographic evidence of heart muscle or pericardial damage, or in the case of death where autopsy reveals laceration or rupture of any portion of the cardiovascular system, causal relationship may be reasonably assumed. Clear evidence of acute heart involvement or death from electrical shock, toxic gases or other poisonous agents, incurred in the course of employment, indicate direct causal relationship. Relatively rare cases of so-called cor pulmonale, heart disease secondary to pulmonary disease, when this pulmonary disease is clearly of industrial origin, belong in the compensable category. This first group, admittedly a small one, is made up of the conditions where the heart disease is actually caused by industrial work and where compensation should be granted without question.

"In practically every other variety of heart damage, we deal with aggravation of underlying disease, and it is here that tremendous controversy begins. Let us examine circumstances where aggravation may be reasonably attributed to the job. When a patient with any type of heart disease, congenital, rheumatic, hypertensive, or arteriosclerotic, reaches the point of heart muscle weakness, usually associated with enlargement, strenuous exertion or a sudden increase in energy demands, may precipitate acute heart failure, usually manifested by flooding of the lungs and inability to breathe satisfactorily. This may result in sudden death, and by sudden I mean immediate; in this case there is no doubt of aggravation. If sudden nonfatal heart failure develops, there is a situation of disability, temporary but not permanent in character, which is due to the exertion. However, when the acute heart failure has subsided, if the physician decides that the patient can no longer return to his job, it is probable that the resulting permanent disability arises from the underlying disease alone and that the acute heart failure merely pointed up that the patient's reserve was not adequate for the work entailed.

"Apart from acute heart failure, the chief problem is that of coronary artery disease in its various manifestations, which Dr. Mattingly has outlined for you. It is generally accepted that coronary arteriosclerosis is not caused by work."

The above quotations demonstrate the problems confronting courts and administrative agencies in attempting to administer our laws when conflicting medical opinions are introduced into evidence in support of or against the allowance of a given claim.

### *The Pneumoconioses*

The problems resulting from claims for the pneumoconioses received national attention on April 15, 1936, when the Honorable Frances Perkins, then Secretary of Labor of the United States, appointed four committees to investigate silicosis in American industry. The committees considered medical control, engineering control, the economic, legal, and insurance phases, and the regulatory and administrative phases of the silicosis problem. A series of conferences, held in Washington under the direction of the U. S. Department of Labor, resulted in the publication of several reports (*5*, *6*).

From the time the reports of the Department of Labor were published, statutory provisions for compensation for the pneumoconioses have been among the most controversial subjects presented to our legislatures. There is no uniformity under the compensation statutes relating to provisions for the compensation of these diseases or for the method of determining the claimant's disability. Basic to the handling of a workmen's compensation claim is proper diagnosis, evaluation of disability, if any, and the decision as to whether or not the claimant should continue work in which he will be exposed to dust.

The medical profession has found no approved method for curing the disease. It differs from other types of industrial diseases in that it occurs as the result of the accumulative inhalation of fine particles of dust (silicon dioxide) over an extended period of time. This may occur while the employee is in the employ of one or several employers. Similarly, it may occur while the employer is insured by one or several insurance carriers. And the medical profession has found no generally accepted method for the evaluation of disability resulting from the disease.

In many instances, employees have been subject to dust inhalation with demonstrable evidence of the disease prior to the time that applicable amendments to workmen's compensation acts became effective. This has resulted in various provisions in our statutory enactments that attempt to make special provisions for certain of the aforegoing features. Included among such provisions are the following:

1. Limitation upon payments of benefits for the pneumoconioses, as of January 1, 1955 (Arizona, Arkansas, Colorado, Florida, Georgia, Idaho, Illinois, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Utah, Vermont, and West Virginia).

2. Denial of compensation for partial disability (Arizona, Colorado, Florida, Idaho, Maine, Maryland, Michigan, New Hampshire, New Mexico, New York, Ohio, Pennsylvania, South Dakota, and Utah).

3. Monetary limitations for medical benefits (Arizona, Arkansas, Illinois, Nevada, North Carolina, Utah, and Vermont).

4. No provision for medical treatment in cases of silicosis (West Virginia).

Other statutory provisions peculiar to these diseases include the requirement (*a*) that the employee must have been employed in the given State where claims are made for a fixed period of time; (*b*) that claim for compensation must be filed within a fixed period of time after last injurious exposure or disability; and (*c*) that in death cases, compensation is payable only where death has occurred within a limited period of time after the last injurious exposure to the hazard of the disease.

Why have statutory provisions of the types above mentioned been incorporated into law? All persons engaged in industrial operations are exposed in some degree to the inhalation of dust, and with increasing age there may be demonstrable evidence of changes of the lungs which may be interpreted as resulting from or caused by dust inhalation. Impairment of lung function accompanied by increasing age may well disqualify an employee from employment in a dusty trade. Again, a given employer or insurance carrier may assume the risk of accrued or potential liability for the dust inhalation

that the employee may have been subject to in prior employment. Add to this the problems of conflicting medical opinion as to the diagnosis of the disease, evaluation of disability resulting therefrom, and prognosis in a given case, and it will be readily understood that with respect to statutory provisions compensating the pneumoconioses, a problem separate and distinct from other types of injuries or occupational diseases is presented to the administrative agencies.

There is general agreement among employers and employees that occupational diseases, including the pneumoconioses, can and should be prevented. In modern industry it is simply good business for the employer to place high on his agenda the establishment of a division of industrial hygiene or department of engineering control for the purpose of determining and controlling all occupational hazards to which the employee may be subject. The administration of such departments leads inevitably to decreased compensation costs and better industrial relations. Employees are justly demanding clean, safe places in which to work and safe tools with which to work; State and Federal departments of health and labor are giving more and more attention to the conduct of industrial operations to the end that the health of employees may be properly protected. Some occupational diseases can be cured; some cannot. Some become the primary factor in the death of the injured employee; with others the disease so sustained may be aggravated by some other condition, or it may aggravate an existing health condition.

Since the primary questions concerning claims for the pneumoconioses or other occupational disease are medical, involving diagnosis, evaluation of disability, and the factor of the disease in causing death, we again raise the query in determining compensability of the claim, "What agency can best resolve these questions?"

### Medical Boards

Compensation administrative agencies and courts generally are composed of lawyers who must reach decisions from conflicting evidence. In certain cases, questions of medical fact may be submitted to juries for determination. Recognizing the importance of the medical issues in compensation claims, the statutes of many States now make provision for medical boards and medical examiners to pass upon controverted medical claims, to resolve controverted medical claims, or to advise the administrative agency which seeks independent and impartial decisions. In most controverted cases, honest differences of medical opinion may exist between the doctor testifying on behalf of the employer or insurer and the doctor testifying on behalf of the claimant employee. Therefore, medical examiners interested only in obtaining justice for the litigants would seem to be best qualified to resolve the medical issues that are presented by the claim.

Differences exist in the statutes of various States relating to the role that medical boards or medical examiners may play in administration of the law. Some statutes provide for hearings before medical boards with the right of appeal upon these issues to the State administrative agency. Some permit the ultimate appeal to courts for the final determination of medical facts. Some statutes provide that the medical examiners shall act in an advisory capacity to the administrative agency. There is no uniformity in these provisions, but legislative recognition is being given to the importance of this feature of the law so that necessary amendments may be made to take advantage of independent and impartial medical opinion.

There should be no attempt to exclude from the record in a given case the testimony of any doctor which is offered by one of the litigants, for the administrative agency would certainly benefit by the advice of such a medical board or medical examiner in the ultimate evaluation of that testimony in its relationship to the issues presented in the claim.

This raises the question as to how the suggested result may be achieved. The answer is that it can be accomplished only by legislative amendments to make adequate and proper statutory provisions for the establishment of medical boards or examiners. Perhaps the most significant role to be filled in the accomplishment of this objective is that to be played by our medical societies. They have, or should

have, the confidence and respect of the various communities where legislation of this type would be considered, and upon them rests the primary burden of taking the initiative to find some solution to the problem.

The ideas presented here are of themselves controversial. There is no agreement on them among employers, insurers, or employees, whose interests may be vitally affected by the decisions to be made. There is no agreement among members of the legal profession as to the value of such boards or examiners to advise administrative agencies, and perhaps there are differences of opinion among doctors not only as to the value of such boards and examiners but also as to the ability to get the best qualified members of that profession to serve. However, the primary objective should be the amendment of the laws to resolve these questions in the best manner possible without bias or prejudice and without the attendant expense to which litigants may be subjected in presenting medical testimony. Certainly members of such boards, by their experience in adjudicating cases and studying the industrial conditions complained of, should be invaluable to the administrative agency in its ultimate decision.

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## New Courses in Environmental Health

Eleven training courses in radiological health, air pollution, water pollution, and food sanitation have been scheduled for January, February, and March, 1958, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

The training courses, part of a continuing program, cover basic education in the environmental engineering field and advanced work in specialized subjects. The first quarter schedule is presented below.

Basic radiological health, January 13–24.

Atmospheric sample analysis, January 13–24.

Environmental health aspects of nuclear reactor operations, January 27–31.

New techniques in bacteriological examination of water, January 27–31.

Microbiological and chemical examination of milk and dairy products, February 3–7.

Laboratory methods for prevention and control of foodborne disease, February 10–14.

Detection and control of radioactive pollutants in air, February 17–21.

Detection and control of radioactive pollutants in water, February 24–28.

Advanced training for sanitary engineers in water supply and water pollution, March 3–14.

Air pollution effects on vegetation, March 10–12.

Sanitary engineering aspects of nuclear energy, March 17–28.

Admission of qualified individuals to all courses is governed largely by priority of application. No tuition fee is charged. Applications should be sent to Chief, Training, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati, Ohio.

# Employment and Retirement of Elderly Workers

W. M. GAFAFER, D.Sc.

IT is now common knowledge that the proportion of persons in the older age groups has been increasing. In 1900 the age group 45–64 years contributed 13.7 percent to the total population; in 1955 the corresponding percentage was 20.2. The group aged 65 years and over constituted 4.1 percent of the population in 1900, the percentage gradually increasing to 8.5 in 1955 (*1*). Moreover, in 1890 as many as 68 percent of the men aged 65 and over were in the labor force; in 1955 the corresponding percentage was less than 40 (*2*). These facts have given rise to what has been known for some time as the problem of the aging worker.

It has been stated that the adoption of certain employment and retirement policies has retarded a solution of the problem (*3*). Under such policies, an increasing body of persons, willing and able to work, may well be lost to the labor force. Hence the potential production as well as the purchasing power of this increasing proportion of the population would be sacrificed. In addition, the question arises of the possible deterioration of the social and economic well-being of this group with all of the attendant implications.

This paper presents some material on hiring and retirement practices based essentially on correspondence with a small sample of industries and on the results of two published surveys. It is hoped that the practices as presented, together with the bibliographic material, will be helpful in the quest for a solution of this urgent problem.

## Employer and Employee Viewpoints

The problem of the aging worker, as one might suspect, is met differently by the employer and the employee. The employer thinks of possible changes in hiring and placement procedures, the optimum employment of the worker as he ages, the effect of aging on work performance, what his responsibility should be with regard to practices before and after retiring, the attitude of older workers toward retirement, the increasing costs of pensions, and changes in retirement policies.

The employee, on the other hand, has another complex of thoughts. He is concerned with the question of adequate income when the retirement age is reached. He is deeply concerned with what his health status and that of his family will be during retirement. In addition to the economic and health aspects there are the psychological ones generated in the workshop and home environments, and deeply conditioned by the feeling that the employee wants to be understood, that he wants to be accepted as he

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is and not remade, and finally that he wants to be given the respect to which he feels entitled. All of these thoughts and feelings have a profound influence on both the employee and the employer.

### Employment Practices

In any consideration of employment practices specifically with reference to the part played by the age factor in the hiring of workers, a number of related factors must be recognized. A company's attitude toward hiring elderly workers is probably influenced by its experiences with the retirement of its employees. Other factors include the physical demands of the particular job, the condition of the labor market, company size, and the type of industry.

Moreover, when no policy with regard to age exists, decisions are made by the employing staff on individual cases. Such decisions may be influenced by the worker's previous length of service with the company. The worker who has grown old in service is viewed differently from the elderly applicant new to the company.

It will be agreed that employment practices are determined by a number of factors, some known and others probably unknown to management itself.

#### *Newspaper "Help Wanted" Sampling*

A reading of one day's help wanted section of a Washington newspaper showed that 87 percent of a sample of 132 advertisements for men workers made no reference to age; the corresponding percentage for a sample of 120 women workers was 88 percent. For men, 13 notices specified that the worker be under 45. These were classifiable according to job as follows: professional and managerial, 4; clerical and sales, 6; and services, 3. For women, 14 notices required workers under 45, with 2 in the professional and managerial group, 10 in clerical and sales, and 2 in services.

Similarly, a New York newspaper revealed no reference to age in about 95 percent of 375 notices for men, and a similar percentage for 1,361 women. Ages under 35 were specified for 13 men, 3 in the professional and managerial group, 9 in clerical and sales, and 1 in the unskilled group. For the women, 70 of the 1,361 notices required workers under 45 years of age, 10 in the professional and managerial group, 58 in clerical and sales, and 2 in services. More than half of the notices requiring clerical and sales workers under 45 specified a "young" woman.

From this newspaper sampling it would seem that a large majority of work establishments did not consider age as a factor in the employment of men and women for certain types of work.

A striking contrast is afforded by the job-opening specifications of the local employment office in seven metropolitan districts representing a nationwide sampling (*4*). Of the 21,000 jobs listed in April 1956, 40 percent specify under 45 years as a maximum age limitation, with little distinction between percentages for men and women. The percentages for certain occupational groups regardless of sex follow: clerical, 57; professional and managerial, 45; service, 35; semiskilled, 33; and skilled, 15. Should the skilled classification be omitted, it will be noted that the proportion of listings specifying a maximum age limitation varies from about one-third for the semiskilled group to more than one-half for the clerical. The relatively low percentage for the skilled classification undoubtedly reflects the growing shortage of skilled workers in many occupations (*5*).

#### *Pennsylvania Survey*

The Pennsylvania survey obtained information on the age factor in employment from interviews with 358 establishments comprising more than a million Pennsylvania workers (*6*). The report pointed out that it is a common practice to establish age barriers to hiring. The percentage of establishments with more than 1,000 employees for different industrial groups imposing hiring restrictions because of age is given below.

| *Establishments* | *Percent with hiring restrictions* |
|---|---|
| Mining | 70. 0 |
| Service | 66. 7 |
| Finance | 57. 0 |
| Trade | 55. 0 |
| Transportation | 53. 3 |
| Manufacturing | 49. 2 |

SOURCE: Based on part of table 3, p. 41, reference 6.

It will be noted that the percentage varied from a maximum of 70.0 for mining to a minimum of 49.2 for manufacturing. Two-thirds of the service establishments had age restrictions as did more than half of finance, trade, and transportation.

The reasons for adopting the policy of imposing hiring restrictions given by establishments with more than 1,000 employees are presented in the table. It will be seen that the chief reasons are physical factors and pension costs. Attention is directed also to the relatively large proportion of establishments giving no reason for imposing restrictions. Reluctance to furnish this information probably reflects the lack of objective support for the adopted policy.

### *Current Hiring Practices*

Some pertinent information was received by correspondence with a company engaged in the making of electrical machinery and equipment, a steel fabricator, an insurance company, a manufacturer of transportation equipment, a department store, and a maker of chemicals and allied products.

The electrical machinery producer, the transportation equipment manufacturer, and the department store did not refer to the adoption of any age policy with regard to hiring.

The steel company indicated that it fills job requirements by selecting from the available labor force those applicants best qualified to perform the work safely.

The insurance company, primarily a compensation insurer, reports that so far as the company is concerned, policyholders could and should employ handicapped persons be they handicapped from accident, disease, or age.

The chemical producer indicated that the policy is followed of hiring the right man for the job regardless of age, adding that the age factor, as well as physical handicaps, is often confused with the more basic issue of the applicant's having nothing to offer which justifies his employment.

Thus, from this small sample of industries employing thousands of workers, it would seem that there is no agreement on the age factor in the hiring of workers.

## Retirement Practices

That it should assist workers in adjusting to retirement seems to be an increasingly accepted responsibility of industry. In 1948 there were relatively few preretirement programs. According to the results of a nationwide survey, more than 50 percent of the companies in the sample had by 1952 some kind of preretirement counseling; by 1954 the percentage rose to 65 with 35 percent of the companies reporting that their interest extended to making one of their employees responsible for visiting retired workers (*7*). As in the instance of employment practices, there are probably a number of factors known and unknown to management which determine the retirement practices currently followed.

### *Current Retirement Practices*

The six companies referred to above also provided some information on retirement practices.

The electrical machinery producer found it

**Percentage distribution of establishments with over 1,000 employees imposing hiring restrictions because of age, according to reason for restriction**

| Reason | Mining | Service | Finance | Trade | Transportation | Manufacturing |
|---|---|---|---|---|---|---|
| Total | 100. 0 | 100. 0 | 100. 0 | 100. 0 | 100. 0 | 100. 0 |
| Physical factors | 56. 0 | ..... | ..... | 50. 0 | 25. 0 | 34. 4 |
| Pension costs | ..... | ..... | 33. 3 | 16. 7 | 50. 0 | 13. 1 |
| Training time | ..... | ..... | ..... | ..... | ..... | 8. 2 |
| Insurance costs | ..... | ..... | ..... | ..... | ..... | 1. 6 |
| Production quality | ..... | ..... | ..... | ..... | ..... | 1. 6 |
| Production rate | ..... | ..... | ..... | ..... | ..... | 1. 6 |
| Other factors | 15. 0 | 50. 0 | 66. 7 | 16. 6 | ..... | 14. 7 |
| No reason stated | 29. 0 | 50. 0 | ..... | 16. 7 | 25. 0 | 24. 8 |

SOURCE: Based on part of table 3, p. 41, reference 6.

desirable in its early deliberations on retirement practices to organize special programs for the preparation of employees for retirement. Currently, however, the company believes that the essential preretirement counseling can best be conducted through previously established continuing appraisal and counseling programs paying due respect to any individual differences that might occur among the group ready to retire. The company considers compulsory retirement desirable and recognizes that separation from service can be made a satisfying experience only if the separation is approached as a mutual interest. Considerable emphasis is placed on the emotional and financial aspects. Interest is also shown in visits by company representatives to the homes of retired employees to determine the effectiveness of any counseling that might have been performed; such visits are scheduled to occur 1 month, 6 months, and 1 year after retirement, and annually thereafter.

The steel company reported that it does not conduct preretirement or postretirement counseling or educational programs.

The insurance company indicated it had a "makeshift" retirement program with a normal retirement age at 65 for men and 60 for women. Management has been given the authority to retain until his 68th birthday a male employee, at the employee's request, at suitable employment depending on physical condition and aptitude; the corresponding age for women is 65. When these ages have been attained, the board of directors alone may request the employee to continue to work under terms laid down by the board. A relatively large number of persons have been kept at work after age 65. The company reports that substantially nothing has been done in the preparation of employees for retirement although the personnel department has had some contacts with a professional counselor on the subject.

Like many other companies, the manufacturer of transportation equipment uses as a basic tool the series of seven booklets issued under the title, My Time Is My Time (*8*). The booklets, generally distributed among the employees at intervals before actual retirement, deal with such subjects as the need for a long preparation for retirement, a review by the employee of his job and of the company for which he works, life insurance and other investments, health, budget making, housing, occupations and hobbies, and restlessness and boredom. The booklets emphasize the strong need for the development of a frame of mind leading to a full and rewarding life after retirement.

The department store subscribes to voluntary retirement. Its workers are privileged to continue working after the age of 65 provided their health and production are maintained. Information on these subjects is developed from an annual physical examination performed by the store physician and a yearly review of performance on the job. Annual interviews on questions of retirement are held with workers 64 years of age and over during the month of their birthday. In addition nine conferences of 1½ hours each, on company time, are devoted to the subject of preparation for retirement.

Retired workers retain all of the privileges they had while working in the store including the usual shopping discounts, group insurance, visits to the medical department, legal department services, and receipt at their home of the monthly house organ.

The store emphasizes the importance of gaining the confidence of employees in the purposes of the retirement program. Moreover, it is insisted that the retired worker continue to feel a part of the organization. In this connection birthdays are remembered and Christmas gatherings are held at which gifts are distributed. Management feels that such activities on their part have a profound, beneficial effect on the morale of the entire force.

The maker of chemicals and allied products feels that no definite plan has been adopted for preparing workers for retirement, and that none of the plans that have come to his attention is sufficiently appealing to warrant adoption; furthermore the correspondent refers to the fact that in a number of companies where lectures and counseling had been used in efforts to provide some preparation for retirement, the programs were terminated after a few years of experience with them. However, the company has urged all of its physicians to discuss retirement plans with workers at the time

of annual physical examinations. Among the items emphasized are choosing satisfying activities long before retirement, considering retirement as equivalent to a change in job and as an opportunity to engage in long postponed activities, and the cultivation of patterns of thinking and motivation which increases the retired employee's usefulness to others.

### *Survey of 657 Companies*

A survey was recently conducted of company practices related to older workers and retirement (*9*). The 657 cooperating companies, located primarily in the East and Middle West, and constituting some 2.5 million employees in the major industrial groups, were selected so that added weight was given to the manufacturing industries and, to some extent, the larger companies. A review of the survey findings not only indicates the extent of such practices but also reveals the kind of practices engaged in by the companies sampled.

In their efforts to prepare employees for retirement, 19 percent of the companies diminish the workloads and increase the free time of employees as they approach retirement age. Sixteen percent make use of hobby shows, publish appropriate articles in their house organ, establish service clubs, present service awards, or give dinners for those retiring. Thirteen percent introduce vocational training for different kinds of work, and less than 3 percent initiate programs on retirement needs.

With regard to preretirement counseling, 54 percent of the companies have interviews with employees on the subject of retirement. In 45 percent the interview covers the amount of pension to be expected and in 34 percent retirement financial problems are considered. Eight percent have a minimum of 2 interviews with the first occurring at least 1 year in advance of the date of retirement.

The question of company contact with the employee after he retires also was raised in the survey. Forty-one percent of the companies encourage retired workers to return for discussion of their problems; 24 percent send out Christmas, birthday, and sympathy letters, company notices, and various kinds of invitations; 22 percent offer financial aid; 15 percent make available their employee social facilities; and 13 percent mail out letters on plant developments.

The 657 companies reported 475 life insurance benefit plans in effect for active workers. About one-third of the plans made available to retired workers the full amount of benefit at no cost, at the same cost, or increased cost; fewer than one-third provided a reduced amount of benefit under similar cost conditions.

A total of 476 plans indicated health insurance benefits in effect for active workers. About 15 percent of the plans made the full amount of benefit available to retired workers at no cost, at the same cost, or increased cost; about 3 percent provided a reduced amount of benefit under similar conditions.

### *Necessity for Adjustment Programs*

One of the observations that might be made from a review of company practices is that there is no unanimity of opinion with regard to the necessity for retirement adjustment programs.

Those not in favor of retirement adjustment programs believe that such programs, although designed to cushion "retirement shock," actually create apprehension in the employee approaching retirement, that long before his retirement he is made to feel that he will be superannuated at a specific age, that the feeling is implanted that retirement will be utopian in character, that the employee's interest in his job may diminish as he rides out retirement, and that in any regard retirement adjustment activities are not the responsibility of management and the concomitant counseling is an invasion of the employee's privacy. Furthermore, as one executive stated, if the employee approaching retirement has problems with which he could have been helped earlier through the established management or community agency channels, he is not likely to benefit from any adjustment program (*7*).

On the other hand, as pointed out earlier, the proportion of industries subscribing to retirement programs is increasing for reasons that are known as well as unknown to management.

## Conclusion

It is unnecessary to belabor the observation made more than a decade ago that the increas-

ing proportion of elderly persons in the population has produced new social stresses and strains. There is no homogeneity in the solutions offered by industry to the two major issues of employment and retirement of the older worker, indicating not only the complex nature of the problem but also the lack of factual material upon which to base a solution. As the problem becomes ever-increasingly urgent progress will be forced, through the accumulation of experiences, leading eventually to the effective use of the skills of the elderly worker and to a full life in the retirement years.

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## Beryllium Case Registry

The Beryllium Case Registry at the Massachusetts General Hospital in Boston was established in 1952 to correlate work exposures causing beryllium poisoning, to delineate its clinical character, to evaluate treatment, and to increase knowledge of the prognosis of the disease. The registry is supported by the Division of Biology and Medicine, Atomic Energy Commission.

Through the registry's data on beryllium poisoning, industrial plants and Government agencies that wish to continue using certain beryllium compounds can learn of measures necessary to prevent the disease. To increase its usefulness, the registry seeks original chest X-rays and biopsy or autopsy material. By its study of accumulated knowledge of cases and by assaying tissue and body fluids for the presence of beryllium, the service has already done a great deal to assist physicians in diagnosing beryllium poisoning. Physicians and medical students are always welcome to study the registry's data.

Beryllium poisoning is of interest in itself and also because it mimics other granulomatous diseases such as tuberculosis and sarcoidosis. With the etiology of beryllium poisoning known it may be possible by clinical investigation and by animal experimentation to expand knowledge of the pathogenesis of a group of diseases difficult to classify and study. It is not yet known how low a level or how short a time of exposure can produce the chronic illness.

There are 528 cases of beryllium poisoning in the registry; 225 are acute and 303 chronic. Cases are entered by number so that the physicians and patients are anonymous. Questionnaires are used in obtaining both original and followup data. The registry may pay for copying original records or for clerical help. Cases are followed annually, through the family physician whenever possible.

Because of the steps industry has taken to prevent exposure to toxic compounds, few if any cases of acute beryllium poisoning are expected to be reported in the future. Chronic beryllium disease, however, continues to appear because of the delay between the last exposure to the compound and the onset of illness.

In the continuing search for new cases of beryllium poisoning or for cases not previously recognized as related to earlier exposure to beryllium, the registry seeks the interest and help of private physicians and public health officials.

Beryllium has assumed industrial significance because of its expanding uses in the construction of nuclear reactors and its effects on the resilience of copper.

—Harriet L. Hardy, M.D., *associate physician in charge of the occupational medical clinic, Massachusetts General Hospital.*

# Industrial Medicine

LEO WADE, M.D.

THE relationship of certain diseases and injuries to occupation has been recognized for hundreds and perhaps thousands of years. With the industrial revolution, first in England and later in this country, the frequency, number, and complexity of such medical problems grew tremendously. The advent of workmen's compensation laws early in the 20th century caused many managers of large industrial plants to seek inplant medical services. These were usually provided by a full-time nurse and a part-time or on-call physician.

The most obvious and most costly medical problems were those secondary to trauma. It is not surprising then that the early inplant doctors were almost always general surgeons whose chief function was the repair and rehabilitation of injured workmen.

Economic, humanitarian, and moral considerations led most managements, with the aid of physicians, hygienists, and safety engineers, to seek ways of preventing injury on the job. The success of these efforts is reflected in the striking increase, during the last 50 years, in the industrial worker's average life expectancy. It is now comparable to that of those not so employed, largely as a result of preventing trauma. Except for occasional dramatic revelations, industrial factors leading to chronic medical disabilities were unrecognized until relatively recently.

One may say with certainty today that any job required by industry can be done without harm or injury to the worker. This conclusion is corroborated by the observations of many effective industrial medical departments. Disability secondary to occupation accounts for fewer than 5 percent, and in some instances 1 percent, of all disability cases (*1*). Careful study of disability secondary to occupation in such plants invariably reveals errors in judgment or performance of the injured workman himself or of one or more of his fellow workers. The frequent accumulation of millions of man-hours in industrial plants without a single disabling occupational illness or injury gives credence to the belief that occupational disability can be all but eliminated.

*Dr. Wade is medical director of the Esso Standard Oil Co., New York.*

## Growth of Inplant Medical Services

In spite of the marked decrease in the frequency of occupational injury and disease, the number of physicians employed by industry has increased tremendously in the past 15 years.

The growth of industry itself might well account for an increased number of plant doctors even though the need for their services has declined. And although the relative frequency of occupational disease has been decreased, such disease has not been eliminated. Even the remote possibility of occasional disaster in historically hazardous industries causes some managers to maintain a readily available medical staff.

Chiefly, however, the increased number of physicians in industry is the product of new concepts of the possible roles of medical services in industry. For example, some managements have yielded to the organized demand of workers for complete therapeutic inplant medical services at management expense as a fringe benefit in lieu of salary increases. In other instances, varying amounts and kinds of

medical services have been provided in efforts to reduce the cost of sickness absenteeism. Most important are the preventive medical programs designed to supplement the therapeutic medical services already available to the worker in the community. The goal of such preventive industrial medical services is to keep the maximum number of workers on the job performing at optimal levels.

Unfortunately, the average person groups all these varieties of medical activity, and still others, under the single label of "industrial medicine." The physician who carries on any of these activities in an industrial setting is known as an industrial physician. Some refinement of terminology is possible and very desirable.

### Industrial and Occupational Medicine

I suggest that the term "industrial medicine" be used to designate that variety of medical practice which deals primarily with the treatment of injury or disease resulting from peculiarities of the working environment and for which the employer assumes a moral and legal responsibility.

Almost all practitioners of medicine are called upon from time to time to treat "industrial cases" and might well be considered, therefore, "industrial physicians." It is impossible to define industrial medicine or surgery in terms of disease entities. Disease or injury occurring as a result of defects in the working environment is in no wise different from that which occurs among persons who have never been employed in industry. A strategically placed roller skate on the cellar stairs may lead to the same injuries as an improperly assembled scaffold on the job. Solvents improperly used to clean the living room carpet may produce the same liver damage and bone marrow depression as when used without proper ventilation in the plant. Proper treatment is the same, and the potentialities for permanent disability or even death are the same. The fact that there is workmen's compensation should not affect the medical care or the end result.

The term "occupational medicine," on the other hand, should be used to designate that variety of medical practice concerned primarily with the prevention and control of both occupational and nonoccupational disease, and not with the treatment of either. Occupational medicine was recently defined as "that branch of medicine which deals with the relationship of man to his occupation, for the purposes of the prevention of disease and injury and the promotion of optimal health, productivity, and social adjustment" (*2*). True occupational medical services are not bargainable fringe benefits. They are essential tools of management for the effective and safe use of workers in industry.

Physicians in industry may be engaged in industrial medicine, occupational medicine, therapeutic medicine (in competition with the private practitioner), or various combinations of these.

### Techniques of Occupational Medicine

For many, industrial and occupational medicine consist of myriads of routine physical examinations and reams of paper work. While both are essential activities in any adequate occupational health program, they are by no means the most basic elements. The peculiar contribution which the physician in industry can make is the maintenance of a safe and healthful working environment. The accepted methodology of public health and environmental medicine provides the framework for the development of safe working practices as well as for proper design and engineering of industrial processes.

The materials used in a given industry or plant, as well as the intermediary and final products, must be known to the plant physician. He must be familiar with the possible health hazards associated with the use of these materials. This physician in industry often knows more about the possible health problems in his particular plant or industry than one can find recorded in the textbooks. He has an obligation to management, the employees, and to the private practitioners of medicine to share his knowledge in the interest of the employee, the consumer, and the general public.

"Working environment" is usually envisioned in terms of fumes, dusts, gases, mists, solvents, noise, radioactivity, radiant heat, and other physical-chemical agents. The working envi-

ronment also includes people—those with buoyant health, the partially disabled, people with personal and social problems or with inadequacies of mentality or emotional adjustment. These workers, as individuals can contribute to a safe and healthful working environment, or they may present a hazard to themselves and to their co-workers. Thus, the employee with tuberculosis or the crane operator with epilepsy can do irreparable harm to his fellow workers. Even a chronic though innocent clash of personalities may be disrupting to the production goal. A sound and comprehensive approach to the working environment involves not only the use of accepted engineering and public health practices but also the practice of good clinical medicine.

A clinical means of providing a safe and healthful working environment is the medical examination program. The basic objectives of such a program should be:

- Elimination of health hazards introduced by virtue of medical defects in the individual employee.
- Early detection of any evidences of health impairment arising from possible inadequacies in the engineering control of health hazards.
- Instruction and guidance of individual workers reporting for examination on proper safeguards to their health so far as occupation is concerned.
- Use of medical information obtained to prevent or control nonoccupational disease.

It is customary to examine the worker (*a*) prior to employment or placement, (*b*) upon return to the job after absences due to injury or illness, (*c*) at appropriate intervals during the course of employment, and (*d*) prior to retirement or other termination of employment.

The preplacement or preemployment examination is almost always a part of the hiring procedure in industry today. There is still a difference of opinion, however, among both managers and physicians in industry regarding the objectives of such examinations. Some insist upon all applicants measuring up to certain minimal standards of physical health. Thus, in some plants an applicant with one or more physical defects, such as an old mitral stenosis or healed tuberculosis lesion, would be automatically excluded from employment. In my opinion this is justified under some circumstances, but usually it is not. Individuals with these or other lesions may be better qualified by training and aptitude to do the available job than other candidates. The medical department should be satisfied if the prospective employee can do the proposed job without hazard to himself or his fellow workers. There is no reasonable basis, however, to assume that such partially disabled persons are more satisfactory workers than those without such defects.

Workers returning to the job after losing time because of sickness or injury should be reevaluated along similar lines. Although such employees should be more useful than the neophyte because of training and experience, they should be able to do their old job in its entirety without contributing a new hazard to the working environment.

The periodic health examination should also be done with full attention to the occupation of the worker. This is equally true whether the employee is subject to the tensions of a boardroom conflict of ideas or the fumes of the lead burner. In either instance, the alert physician in industry will be on the lookout for evidence of uncontrolled or inadequately controlled environmental hazards on the job, as well as any signs that the worker himself is influencing the working environment adversely for his fellow workers.

Some industrial medical departments have segregated the occupational component of the periodic health examination, in the form of the "toxic" examination, an abbreviated periodic examination with attention focused on the job assignment rather than the employee. This approach is wasteful of both doctor's and employee's time, since it necessitates two or more separate visits to the medical department. It assumes that all potential adverse influences of the job on employee health are well documented and easily recognizable physicochemical ones. There is little opportunity or stimulus left to recognize previously unknown environmental influences. The toxic examination focuses the employee's attention unnecessarily on the potential job hazard, stimulating unwarranted anxiety in many instances. Under such circumstances, one may question the justification of doing the periodic examination at all.

**Table 1. Comparison of age-adjusted death rates of white male employees and annuitants of the Esso Standard Oil Co., ages 20–99, with those reported for the corresponding State**

| Cause of death | New Jersey | | Louisiana | |
|---|---|---|---|---|
| | Rate for State, 1950 | Rate for Esso, 1950–55 | Rate for State, 1950 | Rate for Esso, 1950–55 |
| All causes [1] | 14. 94 | 12. 77 | 12. 80 | 11. 10 |
| Primary causes: [2] | | | | |
| Cardiovascular disease | 904 | 809 | 732 | 729 |
| Neoplastic disease | 210 | 260 | 194 | 142 |
| Pneumonia | 31 | 30 | 27 | 58 |
| Cirrhosis of liver | 23 | 27 | 17 | 2 |
| Peptic ulcer | 15 | 14 | 8 | 5 |
| Suicide | 26 | 9 | 22 | 34 |
| Diabetes mellitus | 19 | 6 | 12 | 3 |
| Tuberculosis | 39 | 5 | 43 | 5 |

[1] Per 1,000 population.
[2] Per 100,000 population.

The preretirement or termination examination can also be used as a check on the adequacy of environmental controls, particularly where there is the possibility of a chronic disease with a prolonged "incubation period." It is particularly helpful, however, in the proper administration of company-sponsored insurance programs and workmen's compensation claims. In some instances, it has dramatically prolonged the life of long-service, faithful employees by recognition of asymptomatic, correctible, but life-threatening disease.

Definite contributions to a safe and healthful working environment may be made through careful attention to dispensary and therapeutic activities as well.

The dispensary services provided by industrial medical departments are an invaluable tool in the early recognition of defects in the environmental control program. It is inevitable that dispensary service cares for countless minor nonoccupational ailments, few of which would find their way to the private practitioner's office. Uncared for, these ailments may be costly in terms of overall employee productivity. A satisfactory rule of thumb for the dispensary nurse or physician is to treat any case not involving loss of worktime and apparently amenable to a single therapeutic effort. All other cases may be referred to the family physician.

The alert physician or nurse in the dispensary may identify sources of illness beyond the control of individual workers. The epidemic nature of some complaints may reveal more than the specific nature of the illness. Thus, 10 cases of conjunctivitis or of "nervous indigestion" all coming from a given unit in a plant mean something different to a plant physician than these same 10 cases would mean to 5 or 10 individual practitioners in the community. In such cases the plant physician has a reasonable chance of correcting the basic cause of the epidemic, while the physician outside can only treat the symptoms.

In the treatment of occupational or compensable disease, obviously the minor cases not involving loss of time can be most efficiently cared for by the plant physician. The referral of cases in which worktime will be lost to appropriate private practitioners on a fee-for-service basis has many advantages for all concerned.

The advent of such devices as punchcard recordkeeping and calculators, has simplified the analysis of clinical data obtained in the industrial medical department. Mortality and morbidity data for the employee group and its various segments may be compared with similar data for the population at large. Thus, the physician in industry has another check on the adequacy of engineering controls for known job-related disease. Similarly, the epidemio-

logical approach makes possible the identification of previously unrecognized health problems. To illustrate the use of this technique, I have compiled several tables, the first dealing with death rates (table 1). Since a large percentage of the employees of the Esso Standard Oil Co. work and live in New Jersey and Louisiana, attention is confined to those two States. Even with an employee population of more than 25,000, sizable fluctuations in rate may occur. For this reason, a running average over 5-year periods is used for calculations. It is consoling to both management and employees that the overall death rates for employees are lower than those last reported for the State in which they live. The upward variations observed in several specific disease categories are not statistically significant.

Morbidity data also provide a valuable clue to potential health problems in an employee group. For example, table 2 summarizes all cancer cases occurring among Esso employees and annuitants these past 8 years. The average number of cases over 5-year periods is used to smooth out fluctuations resulting from relatively small samples. Overall rates compare favorably with incidence reported in Public Health Service surveys. Rates for individual organ systems (not shown here) are consistently lower than those reported by the Public Health Service except for skin. The high incidence for skin is attributable to a special interest in this disease. It is well known that skin cancers are rarely ever diagnosed histologically, much less reported in incidence surveys. Fulguration is a common form of treatment. Our data are based on histological examination of all suspicious skin lesions.

**Table 2. Incidence of cancer among white male employees and annuitants of the Esso Standard Oil Co.**

| Disease | Esso employees and annuitants [1] | | | Expected [2] |
|---|---|---|---|---|
| | 1951–54 | 1952–55 | 1952–56 | |
| Total cancer cases | 397. 7 | 395. 2 | 369. 9 | 370. 58 |
| Total cancer cases except for skin | 272. 4 | 276. 5 | 259. 5 | 299. 78 |

[1] New cases per 100,000 employees per year.

[2] Based on Cancer Illness in Ten Urban Areas of the United States, Cancer Morbidity Series Nos. 3 and 10, Public Health Service, 1951, 1952. Incidence figures for Hodgkin's disease were not included. The incidence data are calculated for a theoretical population with a 35 percent New Orleans population and 65 percent Philadelphians, approximating the geographic distribution of Esso employees.

NOTE: Incidence figures represent 5-year moving means.

**Table 3. Comparison of anatomical distribution and cell type of skin cancers among white male Esso employees and the population at large**

| Site and type of cell | Esso (percent) | Expected (percent) |
|---|---|---|
| *Cancer site* | | |
| Lip | 17. 0 | [1] 13. 1 |
| Face, head, and neck | 64. 6 | [1] 70. 1 |
| Extremities and trunk | 18. 4 | [1] 16. 8 |
| *Cell* | | |
| Basal | 55. 8 | [2] 53. 3 |
| Squamous | 36. 4 | [2] 33. 9 |
| Melanoma | 3. 9 | [2] 4. 8 |
| Other | 3. 9 | [2] 8. 0 |

[1] See footnote to table 2.

[2] Based on Morbidity from Cancer in the United States, Public Health Monograph No. 29, Public Health Service Publication No. 418, 1955.

These data were used further to examine the anatomical distribution and cell type of more than 200 skin cancers (table 3). There is no evidence of anatomical localization nor preponderance of cell type which might be expected if the lesions were secondary to industrial exposures.

Such gross data may conceal job-related disease, however, unless careful and constant review of job assignments, for example, is carried on simultaneously. Several of my associates have prepared for publication an epidemiological study which reveals an environmental problem not immediately apparent. I refer to the disease as X. While the plantwide incidence of the particular disease was not striking, the incidence among one group of workers was significantly higher than in the population at large or in the remainder of workers in the same plant. Actually, a previously unrecognized hazard did exist. Incidence rates for disease

X among plant groups engaged in the manufacture of Y are as follows:

| | *Incidence per 100,000* |
|---|---|
| All plant employees | 249 |
| All employees engaged in the manufacture of Y | 354 |
| All employees engaged in the manufacture of Y with 10 or more years' service | 460 |
| Selected employees engaged in the manufacture of Y with 10 or more years' service | 1,500 |
| Other employees engaged in the manufacture of Y with 10 or more years' service | 247 |
| Males of comparable age in general population | 217 |


## Summary

The techniques of occupational medicine, engineering controls, evaluation of the toxicity of materials used or produced, diagnostic examinations, dispensary services, the treatment of compensable illness, and epidemiology, are all directed toward the provision of a safe and healthful working environment. Certain by-products in the realm of nonoccupational disease, such as the occasional dispensary care of minor illness, the early recognition of disease, the provision of health guidance, often seem of great importance to the employee and to management. There is real danger that these by-products may be confused with the basic commodity of occupational medicine. Such confusion must be avoided lest medicine in industry become merely another variety of institutional medicine or a system of medical economics rather than a highly useful and essential medical specialty.


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## Study of Environmental Factors in Atherosclerosis

The relationship between hardening of the arteries in the heart of the human being and his living habits and other environmental factors is under study in a joint project of the New York State Health Department and Albany Medical College. Scheduled for the Albany area, the project is based on a pilot study made in 1956 by Dr. W. G. Beadenkopf, assistant director of the bureau of epidemiology and communicable disease control of the State health department, and by Dr. Assaad Daoud, assistant professor of pathology of Albany Medical College.

The degree of hardening of the arteries is being measured in all adults on whom autopsies are performed at Albany Hospital. For this purpose, Dr. Daoud has developed a standardized technique for measuring the diameter of coronary arteries and the amount of deposits on their interior walls. Following postmortem examinations, Dr. Beadenkopf and his staff are seeking information on the living habits of each person autopsied from clinical records and interviews with family physicians and relatives.

The project, which will include more than 1,600 individuals, is part of an expanded effort of the New York State Health Department to study coronary heart disease in population groups.

# The Private Physician's Responsibilities in Occupational Medicine

B. DIXON HOLLAND, M.D., M.P.H.

DISTINCTIONS customarily drawn between the physician engaged in occupational health and the private practitioner become less sharp when one compares the extent and the nature of the concern the two have for the health of the same individual—the working man. The distinctions must be further reduced. The full-time private practitioner must engage, under some formal arrangement, part time in occupational health services if the needs of the Nation for such services are to be satisfied.

Private practitioners are engaged in occupational health services to a greater extent than most of them realize. Practically all of them, except pediatricians, have as patients individuals who work for a living. For the correct diagnosis and management of a number of diseases and symptom complexes, the physician must ascertain and assess all the factors that may have played, or may be playing, a role in their etiology or aggravation. Bernardino Ramazzini (1633–1714), the father of occupational medicine, recognized this when he taught that the physician should ask his patient one question beyond those recommended by Hippocrates, specifically "What is your occupation?" Information to be elicited with this question will help the doctor to determine which of the patient's symptoms and health defects should be charged to his working conditions or environment, and, of possibly equal importance, which ones should not be so charged.

A knowledge of occupational health, therefore, helps the doctor diagnose and treat the illnesses of some of his private patients.

Moreover, the knowledge gained from a familiarity with occupational illnesses may be applied to housewives, hobbyists, and children, who may use, without proper protection or direction, do-it-yourself kits, solvents, dry cleaners, pesticides, paint, paint removers, and similar materials, many of them hazardous. They may suffer, as a result of such exposure, effects similar to those encountered in occupational medicine, and may require similar treatment.

Another consideration requires private practitioners, collectively as well as individually, to be more interested and active in occupational medicine. It is well known that the vast majority of the employed population of this country work in establishments too small to have a full-time or even a part-time physician and hence are denied that protective health service which is the essence of occupational health.

A substantial proportion of such establishments have nurses, but these nurses usually have little if any direction by a physician. A substantial proportion of such establishments also have arrangements with physicians to treat cases of occupational illness or injury occurring

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among their employees. Some even arrange medical examinations for employees and prospective employees. However, if the majority of the country's work force is to be provided with protective health service of the sort that employees of larger concerns enjoy, it will have to be largely at the hands of physicians in private practice in the community.

It behooves the medical profession, therefore, to encourage arrangements whereby physicians in private practice can provide occupational health service to all employee groups in their community, and to do so in a manner that is satisfactory to all groups concerned. The medical profession should make it possible for physicians in private practice to promote occupational health without risking ostracism by their colleagues.

To protect its enterprising members, the medical society must draw up and promulgate guides on the practice of occupational medicine, full time, part time, or on call, patterned on applicable pronouncements by the American Medical Association, and administered fairly and consistently. Among these the most important are statements prepared by the Council on Industrial Health, particularly that on the scope, objectives, and functions of occupational health programs, published in the *Journal of the American Medical Association* (July 6, 1957, pp. 1104–1106).

Harmonious, cooperative, and effective relations between the plant physician and the private practitioner must be maintained because both are essentially interested in the health of the worker—the plant physician in his capacity as guardian of his health on the job and the private practitioner as his family physician. The genuineness and the effectiveness of their cooperation could have an important, if not critical, bearing upon the health of the worker. Each would derive improvement in his skill and capabilities, as well as peace of mind and satisfaction, from maintaining the closest possible cooperation and communication with the other.

In summary, the best occupational health services possible should be provided to as many of the country's working population as possible. This goal can be achieved only if a far greater number of private physicians serve industry, part time or on call. This requires, and should make for, the closest cooperation and understanding among all physicians in their professional capacity as well as in their capacity as members of the medical society.

## Limited Use of BCG Vaccine Recommended

Use of BCG tuberculosis vaccine should be restricted to groups unduly exposed to tuberculosis and without other adequate means of control, according to recommendations of the Ad Hoc Advisory Committee on BCG of the Public Health Service.

The committee cited a number of reasons why large-scale BCG vaccination programs would be inadvisable. It pointed out that the effectiveness of BCG ranges from 0 to 80 percent. BCG offers no protection to persons who are already infected and are most likely to develop active tuberculosis. Widespread use, moreover, would cancel out permanently the effectiveness of the tuberculin test, by which it can be determined whether or not a person is infected with the disease. Since BCG causes all persons who have been vaccinated to react to the tuberculin test, its widespread use would eliminate one of the important diagnostic means of discovering tuberculosis.

For these reasons, the committee recommended that the vaccine be restricted to such special groups as physicians and other medical personnel working in hospitals having inadequate tuberculosis control programs, families in which a member with tuberculosis must remain in the home, and persons associated with institutions in which exposure is known to be high, as in certain mental hospitals and prisons.

The committee was composed of Dr. Rene Dubos, Dr. Herman E. Hilleboe, Dr. Horace L. Hodes, Dr. Esmond R. Long, Dr. Walsh McDermott, Dr. Gardiner Middlebrook, Dr. Rufus F. Payne, Dr. James E. Perkins, Dr. Leon H. Schmidt, and Dr. Jacob Yerushalmy.

# Employee Health Services

J. F. McCAHAN, M.D.

A STAFF of 9 physicians and 26 industrial health consultants are strategically located about the country to assist policyholders of the Liberty Mutual Insurance Co. in the evaluation and development of inplant medical programs. These specifically trained industrial physicians and nurses aid management and its medical staffs in the development of employee health services as well as in the solution of special problems, such as absentee control, labor turnover, aging work force, vision and hearing conservation programs, and health aspects of hazardous working environments.

An effective employee health service is not something that only the large employers can afford. A good program can be designed for as few as 100 employees if the management is really interested and willing to put forth a reasonable effort in undertaking and supporting it.

What is an employee health service, and how does it relate to promoting the health of the worker? Every company is aware of the importance of proper selection, placement, and maintenance of machines and materials to the success of its business. Management also knows that were it not for the working men and women, production schedules would never be met. A company may not have considered whether employees are suited to the jobs they are trying to perform or whether the company is getting a whole or half employee for the wages it pays. The employee health service should help firms make the most effective use of employees' abilities and skills through proper selective placement and followup health maintenance.

What the workers learn from the plant health service also filters back into their homes. The employer reaps the benefits of a healthier, happier, more productive employee, backed up at home by a healthy family. Such a family is inclined to tell friends and neighbors of the company's interest in them as people; this in turn attracts desirable new employees to the plant or business.

The preplacement examination is performed before the employee is assigned to a job. The plant physician can advise management of the abilities and capacities of the individual so that he can be placed where he can work effectively without jeopardizing his own or his fellow workers' health or safety. Then, just as it plans the maintenance of machines, the company should arrange for periodic health examinations of employees, preferably on a voluntary basis. Those who are working in a hazardous area or with toxic materials, or whose work involves the safety of others, such as operators of moving equipment and food handlers, should have regular, compulsory examinations.

The examining physician should discuss his findings with each employee and counsel him on ways he can preserve or improve his health. The physician may discover diseases or abnormal conditions that will require referral to the family physician or to an appropriate community agency for diagnosis and treatment.

Most importantly, periodic physical examinations afford the best opportunity for early discovery and treatment of diseases and impairments. Examination findings should be

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handled in a confidential manner so that the industrial physician becomes the employee's health counselor and can assist the family physician in following up the continuing health maintenance of each worker.

All nonoccupational illnesses and injuries should be promptly referred to the family physician if more than first aid or emergency care is required. Occupational injuries and illnesses are quite properly cared for by the industrial physician within the limitations placed upon him by the workmen's compensation laws and regulations that apply in particular areas.

Despite all attempts to help people keep well, there will always be some who will become ill or injured. The medical staff should maintain an emergency service to which all employees can turn for emergency relief and advice on all illnesses and injuries that occur or are identified by employees while on the job.

Through the maintenance of adequate records and statistics, the industrial physician and nurse can determine whether a program is meeting employee needs. They can give positive direction for necessary changes and modifications. These data also assist the medical staff in designing a health education program specifically to meet their needs—one based on the problems that are causing disabilities.

Through health counseling and health education, the physician and nurse in industry have the opportunity to make a significant contribution to employee efficiency. When an employee comes to them for advice and guidance because he doesn't feel well, or he has a sick wife or a child who is a behavior problem, or he thinks his supervisor is riding him, or because he thinks his present job is too much for him, the company is reaping some of the real benefits from the employee health service. A good employee can be saved from becoming less than 100 percent effective on his job. Eventually he may be saved from becoming an absentee or total casualty for varying periods of time.

## Census of Industrial Nurses

The 1957 census of industrial nurses shows 16,223 are working full time in industry in 45 States, the District of Columbia, Hawaii, and Puerto Rico. This number, as of January 1, 1957, is an increase of 5,127 professional, registered, industrial nurses over the 1952 census total of 11,096.

Questionnaires sent to State and Territorial health departments and the New York and Massachusetts State departments of labor supplied the information for the census.

California, Illinois, Michigan, New York, Ohio, and Pennsylvania each have more than 1,000 nurses employed full time in industry. These six States account for 54.7 percent of the reported total number of industrial nurses. North Dakota, New Mexico, and Alaska reported no industrial nurses.

The census queried nurses about the size of the plants in which they are employed, the type of medical direction they receive, their professional education, and their industrial nursing experience. Census information given below is based on the number of nurses who replied specifically to these queries.

| *Size of plant* | *Percent of 7,750 reporting* |
|---|---|
| Less than 500 employees | 18.6 |
| 500–1,000 employees | 22.8 |
| 1,000 or more employees | 58.6 |

| *Medical direction* | *Percent of 7,541 reporting* |
|---|---|
| Full time | 35.7 |
| Part time | 36.9 |
| On call | 21.7 |
| Other types | 5.7 |

| *Professional education* | *Percent of 6,986 reporting* |
|---|---|
| Preparation in occupational health or public health nursing | 23.7 |
| Other special fields | 11.1 |
| Basic nursing only | 65.2 |

Copies of the Census of Industrial Nurses as of January 1, 1957, by Mabelle J. Markee and Elizabeth G. Sullivan, are available from the Occupational Health Program of the Public Health Service.

# Occupational Health Information Exchange

DOHRMAN H. BYERS, M.S.

RAPID advances and developments in modern industry and agriculture have made it very difficult to keep abreast of changes and their associated health hazards. Every year new materials, new processes, and new stresses are introduced into the working environment in tremendous numbers. Each of these represents a potential occupational health problem until evaluated by experience or study. The usual public health data, such as morbidity and mortality figures, do not contribute greatly to the detection or evaluation of such occupational diseases.

This situation has resulted in a growing need for the systematic collection and dissemination of occupational health information by a centralized facility with the cooperation of public health agencies, medicine, industry, labor, academic and research institutions, and all others having interest and responsibility in the prevention of occupational disease.

The Occupational Health Program of the Public Health Service has recognized the need and moved to meet it by establishing the Occupational Health Information Exchange as a distinct and recognized activity within the program. The exchange is operating as part of the Occupational Health Field Headquarters in Cincinnati, Ohio. The establishment of this exchange represents the organization and intensification of an activity carried out to some extent in the past by staff correspondence and consultation. The specialized experience and knowledge of the staff will be an integral part of the new exchange, supplementing and evaluating the information services.

The Occupational Health Information Exchange will serve as a central agency for the collection, collation, and dissemination of all types of information pertinent to occupational health problems. Most of the information to be assembled will fall into three broad groupings:

1. Information on the detection, evaluation, and control of health problems of the worker will include data from industrial experience; case histories of new or unusual occurrences, exposures, or illnesses; results of research and investigation; and morbidity and mortality figures on occupational diseases. Acquiring information on problems arising from new materials, operations, or conditions in the working environment will be emphasized.

2. Information on technological developments and trends will include data on the identity and nature of new materials, processes, and industries as well as basic figures on employment, production, and consumption of products.

3. An inventory of research and service facilities active in any field of occupational health will be kept current with obtainable information regarding personnel, projects, and programs.

### Acquiring Data

While recourse to the technical literature is intrinsic to such an information service, the primary purpose of the exchange is to acquire, evaluate, and provide unpublished or otherwise unavailable data insofar as is possible. A large, relatively untapped reservoir of unpublished, uncoordinated, or fragmentary data accumulates in day-to-day experience in industry and

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in occupational health research and service activities. Much of this material is not published because it does not seem sufficient to merit publication. Often limitations of time and personnel or other causes prevent publication.

By bringing together and collating such piecemeal information from a variety of sources, it will be possible to recognize or predict answers to many questions concerning occupational exposures and diseases. The correlation of data on exposures of humans under actual working conditions with results of toxicological studies on animals will be facilitated. Better information on the occurrence, nature, and prevalence of new occupational diseases and on the effectiveness of control measures should result.

Summation of data on trends in occupational exposures and inventorying of resources should contribute greatly to better utilization of both governmental and private industrial health facilities and professional skills. Through a better understanding of the potential and relative importance of problems, available resources could be focused on the most significant problems. A centralized inventory of research and service programs can provide a degree of voluntary coordination of the programs, expediting many activities and avoiding duplication of efforts. Areas in need of investigation could be called to the attention of organizations with the facilities and interests to deal with them. Inquiries could be channeled to the most authoritative sources.

### Information Sought

To gather the necessary information for accomplishing our objectives, we must have the assistance and cooperation of many sources. Industry, labor, the medical profession, governmental agencies, academic institutions, research foundations, consulting laboratories, insurance companies, allied information services, and a multitude of others are called upon to contribute information as they are able. No fixed form or pattern for the submission of data is contemplated now. Suitable forms and procedures may be worked out with any group able to supply material on a routine basis. The system must remain flexible enough to accommodate all sources, whether they are individuals or institutions. The ultimate success of the information exchange will depend to a great extent on voluntary and unsolicited contributions of information.

Information will be disseminated by publications and direct letter replies to inquiries. We anticipate that material will be given out mostly by correspondence in response to specific requests for some time, until files and staff can be built up to the point where new, pertinent publications are possible. We do not now plan to have any periodical bulletins, but will publish information at suitable times. Although the Occupational Health Information Exchange is still in the formative stages, we have considerable data in the consulting files and the staff experience of the Occupational Health Program is available. Already we have received contributions for our files and have answered a number of inquiries. We are confident that most persons interested in occupational health or public health will give us items of information as well as an opportunity to serve them.

# Employee Health Benefit Programs

LOUIS S. REED, Ph.D.

*Two major developments in recent years have had a significant effect on the health status of millions of American workers. One has been the shifting emphasis of inplant health programs from care of work injuries to concern for the general health of the worker. Through diagnostic and preventive services, these programs are contributing more and more to health conservation and maintenance. The second development, more widespread and far-reaching, has been the phenomenal growth of employee health benefit plans providing, or paying the cost of, medical care. These two types of programs can and do stand alone. But where both exist, they are more effective, each drawing strength from the other.*

A VITAL component of the benefit programs for workers in private industry which have mushroomed in the United States during the last 15 or 20 years are employee health benefit plans, designed to provide health insurance or health services to workers and their dependents. At present, health insurance programs made available and paid for through the worker's place of employment cover more than 35 million employees and their 54 million dependents, a total of 89 million people. Under such plans, about 68 percent of all nonagricultural employees are protected against the cost of certain health services or have the services themselves made available to them. The growth since 1935 in the number of employees and dependents covered for hospitalization, surgical, and medical benefits under employee health benefit plans is shown in table 1.

Before the early 1930's, employee health benefit programs consisted largely of plans developed by a few employers, frequently those in isolated areas, for the direct provision of health services. Most of these plans were in the mining, railroad, lumber, and textile industries. Employee health benefit plans as we now know them began to evolve in the midthirties when hospital and medical service plans, precursors of today's Blue Cross and Blue Shield, were formed, and insurance companies began writing group hospital, surgical, and medical insurance.

The rapid development of employee benefit programs since 1940 is the result of several factors. Among them are (*a*) high corporation taxes during and since World War II, (*b*) various court decisions holding that welfare and pension programs are "bargainable" issues, (*c*) wage stabilization programs during World War II and the Korean conflict, which tended to keep wage rates down but permitted increases in fringe benefits, and (*d*) the movement of labor unions to incorporate welfare and pension benefits in their wage policy.

Since 1948 health benefits, along with life and disability insurance benefits, have come to be important elements in collective bargaining agreements. Only a half million workers were covered for health or life and disability

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**Table 1. Employees and dependents covered under employee health benefit plans**

[Millions of persons]

| End of year | Hospitalization | Surgical benefits | Medical benefits [1] |
|---|---|---|---|
| 1935 | 2.0 | 1.8 | 1.8 |
| 1940 | 9.5 | 3.5 | 2.0 |
| 1945 | 24.8 | 9.3 | 3.2 |
| 1950 | 54.5 | 38.6 | 16.8 |
| 1955 | 81.6 | 73.4 | 40.8 |
| 1956 | 89.3 | 82.0 | 54.3 |

[1] Mainly restricted to care in the hospital.

SOURCE: Estimates based on the annual surveys of the Health Insurance Council on the extent of voluntary health insurance in the United States, the annual surveys of group insurance by the Life Insurance Association of America, annual Blue Cross and Blue Shield enrollment reports, and publications of the Social Security Administration on extent of coverage under independent prepayment plans.

insurance benefits under such agreements in 1945. By 1950 about 7 million workers were so covered, and in early 1954, more than 11 million.

### Types of Health Benefits and Carriers

Table 2 shows the number of employees and their dependents covered under health benefit plans for various health services, by type of carrier. At the end of 1956 approximately 35.4 million employees were covered for hospitalization through plans made available and paid for through the workplace. With their dependents a total of 89.3 million people, more than half of the population, were so covered. The latest figures of the Health Insurance Council show that, after allowance for duplicating coverages, approximately 116 million persons in the United States have some type of hospitalization coverage. The difference between these two figures represents people covered by individual (nongroup) insurance and those covered through rural and similar non-employer-employee groups.

More than 94 percent of the persons covered by employee health benefit plans for hospitalization benefits are insured, in roughly equal proportions, through Blue Cross plans and the few Blue Shield plans that offer hospitalization benefits or through group policies of insurance companies. The remaining 6 percent, 2.1 million employees and their dependents, are served through other types of plans. These last include the so-called independent prepayment plans under community, cooperative, or private medical group auspices, such as the Kaiser Health Plan, the Group Health Association, and the Ross-Loos Medical Group, and management- and union-sponsored self-insured programs such as the United Mine Workers medical program. The self-insured plans provide health services or benefits directly rather than through the purchase of insurance or prepayment coverage.

For surgical benefits approximately 82 million workers and dependents are covered, more through insurance companies than through Blue Shield and the few Blue Cross plans that

**Table 2. Employees and dependents covered under employee health benefit plans, by type of benefit and carrier, end of 1956**

[Millions of persons]

| Type of benefit and carrier | Employees | Dependents | Total |
|---|---|---|---|
| Hospitalization | 35.4 | 53.9 | 89.3 |
| Blue Cross and Blue Shield plans | 16.6 | 24.9 | 41.5 |
| Insurance companies | 16.7 | 27.0 | 43.7 |
| Other [1] | 2.1 | 2.0 | 4.1 |
| Surgical | 32.9 | 49.1 | 82.0 |
| Blue Shield and Blue Cross plans | 13.3 | 19.9 | 33.2 |
| Insurance companies | 17.4 | 27.0 | 44.4 |
| Other [1] | 2.2 | 2.2 | 4.4 |
| Medical | 22.3 | 32.0 | 54.3 |
| Blue Shield and Blue Cross plans | 10.6 | 15.9 | 26.5 |
| Insurance companies | 9.6 | 14.1 | 23.7 |
| Other [1] | 2.1 | 2.0 | 4.1 |
| Major medical expense [2] | 3.1 | 3.8 | 6.9 |
| Comprehensive medical expense [2] | .5 | .9 | 1.4 |

[1] Independent prepayment plans and self-insured programs.

[2] Insurance companies only.

SOURCE: For Blue Cross and Blue Shield, the 1956 survey of the Health Insurance Council (reference 1), the data being adjusted to show employer-employee group enrollment only; for insurance companies, the 1956 survey of group insurance by the Life Insurance Association of America (Group Insurance and Group Annuity—Continental United States Business—1956); for the "other" plans, the Health Insurance Council's report with adjustments to show employer-employee group enrollment only.

provide such benefits. Again only a small proportion are covered under independent or self-insured programs. For medical benefits about 54 million persons are covered, the great majority under programs which provide only inhospital medical service. Probably not more than 9 million persons have coverage for physician service in the office and home as well as in the hospital.

About 6.9 million workers and their dependents are also covered under group major medical expense policies, which supplement regular hospitalization, surgical, and medical coverages, and another 1.4 million are covered under comprehensive medical expense insurance policies.

**Table 3. Contributions under employee health benefit plans, 1956**

[Millions of dollars]

| Type of benefit and carrier | Total | Employer | Employee |
|---|---|---|---|
| Hospitalization: | | | |
| Blue Cross and Blue Shield plans | $812 | $244 | $568 |
| Insurance companies | [1] 690 | 345 | 345 |
| Other [2] | 79 | 39 | 40 |
| Surgical-medical: | | | |
| Blue Shield and Blue Cross plans | 353 | 106 | 247 |
| Insurance companies | [1] 436 | 218 | 218 |
| Other [2] | 83 | 58 | 25 |
| Major medical expense (insurance companies) | [1] 52 | 26 | 26 |
| Comprehensive medical expense (insurance companies) | [1] 42 | 21 | 21 |
| Total | $2, 547 | $1, 057 | $1, 490 |

[1] Premiums after deduction of dividends.
[2] Independent prepayment plans and self-insured programs.

SOURCE: In "Total" column, data for Blue Cross and Blue Shield plans are total subscription income as reported by the central organizations of these plans to the Social Security Administration, adjusted to show only income from employee-employer groups; data for life insurance companies are total net premiums as reported from the 1956 survey of group insurance by the Life Insurance Association of America, adjusted for deduction of dividends; data for "other" plans are from the 1956 survey by the Health Insurance Council.

It is estimated that employee contributions represent 30 percent of total Blue Cross and Blue Shield group premiums, 50 percent of total insurance company premiums after dividends, and 70 percent of income of "other" plans. These approximations are based mainly on estimates from the executives of a few large Blue Cross plans and insurance companies as to the relative proportions of employer and employee contributions, on knowledge of the situation in some of the large independent plans and self-insured programs, and on the general showing of a few surveys of group insurance programs which indicate prevailing cost-sharing arrangements.

### Amounts and Sources of Contributions

Contributions, or expenditures, for employee health benefit plans in 1956 totaled, it is estimated, approximately $2.5 billion (table 3.) Precise data are not available on the portion of the contributions paid by employees and the portion paid by employers. The figures given in table 3 are only rough approximations based mainly on estimates by a number of insurance company and Blue Cross executives as to the prevailing division in their programs. Of the contributions for all plans it is roughly estimated that about two-fifths represent employer and three-fifths employee contributions.

There is a decided trend toward increased financial participation by employers in health insurance plans for their employees. Employers frequently pay the total cost of the program for both employees and their dependents. Also common are arrangements under which the employer pays a part or all of the cost for the employee, who in turn pays the cost for his dependents. Under most collectively bargained plans the employer pays from one-half to all of the cost. Welfare funds are almost universally financed wholly by employer contributions.

Employers' contributions arranged through collective bargaining agreements are generally regarded by the workers as part of their compensation. Even under programs not collectively bargained, there is a tendency for employees to consider fringe benefits as part of their pay.

The tax situation is a contributing factor toward encouragement of employers to assume the costs. An employer's payments for benefit programs are a business expense, deductible from the concern's gross income. An employee's payments come out of personal income subject to income taxes. An employer's dollar buys a dollar's worth of benefits, but it takes more than a dollar of an employee's income to buy a dollar's worth of benefits.

### Administrative Arrangements

Employee benefit plans are set up and administered in two ways: by the employer alone or by the employer and the union as part of a welfare fund. Under the first arrangement the employer makes a certain program of insurance benefits available to his employees, paying either the whole cost or that portion over and above specified employee contributions. Where there is no union, the employer decides on the program, chooses the insurance carrier or plan through which benefits will be made available, maintains the contacts with the carrier, and deducts the employees' contributions, if any, from their pay. Where there is a union, the union and the employer together choose the program, determine the level of benefits, and sometimes select the insurance carrier.

Under a welfare fund arrangement, a single employer, or much more commonly many employers, and a union have agreed upon establishment of the fund into which the employer makes specified contributions, usually a certain number of cents per employee-hour worked or a certain percentage of wages paid to workers covered under the agreement. Such funds must be set up in accordance with requirements in the Labor-Management Relations Act of 1947. They must be managed by trustees representing in equal numbers the union and the employer (or employers) with an arrangement for breaking ties in the event of a deadlock. There must be a written agreement stipulating the basis of the employer's contribution, an annual audit of the finances, and separation of money for welfare benefits from that for pension benefits.

Typically, a jointly managed welfare fund results from an areawide or regionwide agreement between a union and all employers of members of that union in the area. Once the fund has been established, its trustees agree on a program of benefits and the vehicle through which the benefits are to be provided.

It has been estimated that of all employees under welfare plans, 92 percent are under employer-administered plans, 7 percent under funds managed jointly by several employers and a union, ½ of 1 percent under funds managed jointly by a single employer and a union, and ½ of 1 percent under wholly union-administered (no employer contributions) plans.

### Trends and Issues

A salient feature of employee health benefit plans is their diversity. Benefits range from meager to fairly comprehensive. The plans are written by perhaps 250 prepayment organizations and 100 or more insurance companies, all with diverse offerings, some with permutations of contracts or policies ranging into the hundreds, and many willing to write virtually any contract requested by an employer, an employee group, or a union.

A major trend has been toward more comprehensive coverage of health services. Prepayment plans and insurance companies, 20 years ago, first offered only hospitalization benefits, and these were limited to 21 or 30 days and were restricted to employees. The contracts were quickly expanded to include dependents. Progressively, they were extended to include surgical and inhospital medical benefits. Hospital benefits were broadened until today some Blue Cross plans and insurance companies will provide complete care for 365 days or longer. There has also been some coverage of physician calls in the office and home, and of X-ray and laboratory services outside the hospital.

Within the last few years there has been a wide sale by insurance companies of major medical expense policies, supplementing the basic hospitalization, surgical, and in some instances medical coverages. These policies typically pay 75 or 80 percent of all medical expense in any illness over and above the benefits provided by the basic policy and a "deductible" of a given amount which the employee must pay himself. More recently, there has been considerable growth of comprehensive medical expense policies, which in effect combine the basic and major medical coverages in a single package. These plans meet 75 or 80 percent of medical expenses in any illness or year over and above an initial deductible amount. The Blue Cross and Blue Shield plans to some extent have developed analogous coverages or have ex-

tended their basic programs to offer more comprehensive coverage.

These developments indicate an awareness on the part of the public of the need for and desirability of prepayment coverage which will provide all-inclusive protection against the cost of serious illness. While further impressive advances in the growth of health insurance may be expected, there are no settled views in this country as to the nature and scope of such programs. Certain fundamental questions must now be faced: How far should health insurance go in providing a completely comprehensive health service? Should it cover physician service in the office and home, nursing care, dental care, drugs, eye care? Should it provide periodic health examinations and preventive services? What is the basic objective of these programs? Is it to provide protection against the risk of heavy medical costs? Is it to make available to people on a convenient budgeting basis all services necessary to prevent illness, maintain health, and care for disease and injury? These initial questions are central to the underlying philosophy of health insurance plans.

Other equally fundamental questions concern the administration and operation of such plans. For example, is it desirable that insurance should provide or make available specified health services, with the insured having no direct payments or charges to pay, or should it be content to pay a major portion of the costs? Are "deductibles" and "co-insurance" necessary to keep utilization of health services within reasonable limits, or can this goal be best achieved by other means? By what means can the costs of hospital and medical services best be held to reasonable levels? Is medical service best and most economically provided through individual practitioners selected by the patient and paid on a fee-for-service basis, or through organized medical groups where physicians work as a team? Does insurance have no concern or every concern with the quality and adequacy of care received by patients?

As yet not even the beginnings of agreement on the answers to these and other questions are apparent.

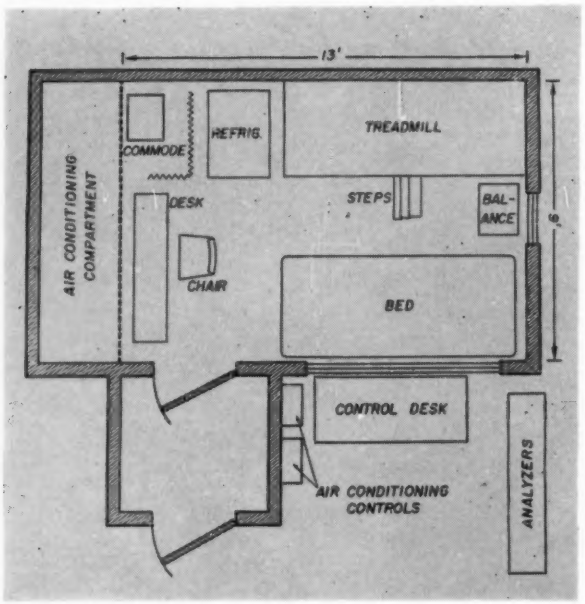
In this situation employee health benefit plans are playing an important role. These plans marshal the consumers of medical care into cohesive and vocal groups. An employer with tens of thousands of workers and an outlay for health insurance of several million dollars a year has a strong interest in the answer to the questions posed. So does a labor union with hundreds of thousands of members which is bargaining for and shaping a health benefit plan.

Employee health benefit programs are a dynamic factor in the development of health insurance. Large employers and unions are continuing to seek experimental health insurance policies or contracts with broadened coverage and scope of benefits. In some instances, where they find they cannot purchase the broad insurance coverage that they want, they are developing their own self-administered program. In the future, the influence of employee health benefit plans may be expected to extend beyond the worker groups which they cover directly. They may well contribute to the evolution of health insurance plans which will provide more comprehensive benefits to the rest of the population as well. In this way they could help raise the level of protection against the costs of medical care for the Nation as a whole.

#### REFERENCE

(1) Health Insurance Council: The extent of voluntary health insurance coverage in the United States as of December 31, 1956. New York, N. Y., The Council (Association of Casualty and Surety Companies and other associations), 1957.

# Metabolic Chamber




Long interest in the effects of activity and disease on human energy has led to the construction of a sealed chamber large enough to allow patients to carry on varied ambulatory activity during metabolic tests. At the National Institute of Arthritis and Metabolic Diseases, Public Health Service, where the project was developed, the person under test lives a relatively normal life for several days in the precisely controlled climate of the chamber, which is attached to a battery of recording and analyzing instruments. Physicians and scientists are thus able to discern new facts on the intimate process of human use of food for the building of tissues or for conversion to useful energy.

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*Flanking the double-doored entrance to the chamber (opposite page) are intricate analyzing and recording instruments, on the right, a control panel facing the picture window, and an electrocardiograph, lower center. A unique feature is the plastic helmet worn by test patients (right). Suction draws expired air through a plastic tube to electronic instruments. Fresh air enters under vinyl plastic apron, passes within the hood and around the subject's head. Through the "elephant's trunk," he may scratch his nose, shave, wash, and take liquids through a straw. In the chamber (below) he reads, works at the desk, or walks on the treadmill for exercise. The window shown here overlooks the countryside. Also in the room are a picture window facing the control room, a refrigerator, commode, and scale. The subject converses through a combined speaker and microphone in the helmet, part of a two-way communication system.*

Over the years, scientific investigators have accumulated much information on the basal rate of metabolism of man in the resting state and some data on isolated aspects of metabolism for short periods of activity. Now, for the first time, they are able to obtain readings on the metabolism of man active for sustained periods of time.

A system of continuous collection of expired air coupled with the use of continuously recording stream gas analyzers indicate minute-to-minute patterns of variation in oxygen-carbon dioxide exchange. This feature permits close analysis of the characteristics of gas exchange in studies of the expenditure of exercise energy and of work efficiency. Also measured are changes in expired air gas concentrations over many hours or days, contributing to the study of the influence on total energy metabolism of a variety of environmental, hormonal, nutritional, and other factors.

The metabolic chamber is about 9 by 13 feet with an 8-foot ceiling. It is an open circuit, indirect calorimeter, conditioned for close control of temperatures ranging from 5° to 49° C. and relative humidities of 10 to 95 percent over most of the temperatures. Air recirculates through the chamber at a rate of 1,300 cubic feet per minute but air velocity is low, less than 50 feet per minute, attained through inlet ports over the entire ceiling and a large exhaust area over half of one wall.

Air flowing into a collection hood over the subject's head and shoulders is carried outside the chamber by a flexible tubing reinforced by steel spring wire along a main line through an air volume meter to a vacuum line. The flow rate is close to 100 liters per minute, about 10 times the volume an individual breathes in and out each minute while resting. Separate vacuum and pump systems pull air from the main line at constant rates of 50 and 100 cc. per minute. Periodically valves are switched so that analyzers tap fresh air directly from the chamber for reference or baseline. Before and after each test, the gas analyzers are calibrated by flowing into the empty hood known constant flow volumes of carbon dioxide from a calibrated spirometer. This volume mixes with the main flow of fresh air, supplying a known addition of $CO_2$ and a known reduction in oxygen concentration.

Data on relative humidity, oxygen, and carbon dioxide from the analyzers are fed to the multiple point Speedomax continuous recorder. Between events in the chamber and their record, there is a time lag of about 2 minutes, representing time required for air to flow to the analyzers and for the analyzers to state the concentrations faithfully. The project, according to scientists at the institute, is directed toward establishing a technique of total energy balance which may provide answers to fundamental physiological questions of energy metabolism.

The chamber was developed in the institute by Drs. G. Donald Whedon, chief, Metabolic Diseases Branch, and Russell M. Wilder, former director of the institute, now retired. They were assisted by Ernest E. Huber, Jr., a physicist, and Ronald H. Thompson, a physiologist.

## Weekly Reports on Acute Respiratory Diseases

From information gathered during household interviews, the National Health Survey of the Public Health Service is issuing a series of weekly reports on the prevalence and incidence of acute respiratory diseases severe enough to cause bed disability.

Including figures for influenza, pneumonia, and similar conditions, the reports estimate the number of cases in continental United States during each week since mid-July 1957, and the average number of persons in bed each day as a result of the diseases. Estimates for the most recent week are provisional.

The first report, issued November 7, covered estimates through the week ending October 12 and included a description of methods used in compiling data, definitions of the disease group and of indexes, and a statement on the reliability of the data.

The weekly reports, Current Statistics on Respiratory Diseases, may be obtained from the National Health Survey, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

# Dieldrin Poisoning in Man

WAYLAND J. HAYES, Jr., M.D., Ph.D.

*In certain programs, 10–20 percent of spraymen applying dieldrin for the control of disease vectors have been poisoned. Half or more of the reported cases were characterized by epileptiform convulsions. In general, the occurrence of poisoning parallels the intensity and duration of exposure but the factors influencing safety are too little understood. Ordinary, careful medical examination may offer the most sensitive and practical way of detecting preclinical poisoning, thus removing workers from exposure to prevent serious illness.*

THERE IS NO DOUBT about the value of dieldrin in the control or even eradication of certain vectorborne diseases. Unfortunately, its use under certain conditions has led to poisoning of some of the workers who received extensive daily exposure for long periods. Information on the epidemiology and clinical course as well as the more recently described preclinical signs of this poisoning is bound to be of interest to those who use dieldrin or contemplate its use in control programs. This review was written because information on dieldrin poisoning has not been publicized widely.

*Dr. Hayes is chief of the Toxicology Section, Technical Development Laboratories, Communicable Disease Center, Public Health Service, Savannah, Ga.* *He submitted this report to the Pan American Sanitary Bureau in his capacity as technical consultant to the bureau at the Symposium on Toxicological Investigations of Dieldrin held in Maracay, Venezuela, on May 15–16, 1957. The symposium was sponsored by the division of malariology of the Venezuelan Ministry of Public Health and Social Welfare.*

*The Spanish version of this paper is being published in the December 1957 issue of the Boletín de la Oficina Sanitaria Panamericana.*

If it were possible, it would be desirable to state the conditions which have led to poisoning in one place and those which have permitted the safe use of dieldrin in another locality. Differences in spray practices and in the personal habits of workers are obvious but not very enlightening. It is easy to find examples of "carelessness" in the groups in which cases of poisoning have occurred, but the same is true among workers who have remained well. Dieldrin has been used under strict supervision in some programs and with little supervision in other programs without producing poisoning. The number of workers involved or the amount of dieldrin really used by individual workers in these programs is frequently so small and the duration of use is so short that no useful information can be gained about the safe use of the compound in a large, continuing program.

It would seem that many reported cases of poisoning were the expected result of flagrant disregard of precautions suggested by the World Health Organization (*1*) or other groups. It appears reasonable to conclude that dieldrin should not be used where lack of water or some other factor makes the practice of cleanliness impossible. If the normal standards of hygiene are low, the use of dieldrin

should be considered only if extensive supervision of the labor force can be exercised.

There is a need for time-motion studies of workers and measurements of their respiratory and especially their dermal exposures under different conditions.

Because of the need for dieldrin, any research would be a great contribution if it proved the value of some combination of procedures permitting safer use of the compound under practical conditions. As indicated below, an approach which appears hopeful is that associated with the early detection of preclinical illness.

Illness in Venezuelan spraymen caused by repeated exposure to dieldrin was first mentioned by Carrillo in 1954 (*2*). Although dieldrin was at first discounted as the cause of sickness, the true relationship was recognized very soon, according to A. Gabaldon (personal communication, 1954). Poisoning similar to that in Venezuela was also observed in Nigeria (*3*) and in Ecuador, according to information supplied by Lópes da Silva in 1956. In the United States, also, poisoning characterized by convulsions and associated with dieldrin and closely related compounds was observed in industrial workers (*4*).

Later and more complete studies of clinical poisoning have been reported by Blázquez and Bianchini (*5–7*). From the work which has been done, the following conclusions seem clear.

### Clinical Illness

1. Under practical conditions of work in Venezuela, Ecuador, and Nigeria, clinical poisoning has been reported in about 10 to 20 percent of spraymen (table 1).

2. The earliest observed poisoning occurred after a little less than 3 months of exposure. However, in the most comprehensive study available (*7*), no cases occurred in less than 4 months of exposure, and only 2 percent of the spraymen exposed less than 8 months became sick. In general, the proportion of sprayers poisoned increased with the duration of their work (table 2). Twenty-six percent of workers exposed 8 months or more became sick. In consideration of the inevitable variation in the intensity of exposure of different workers and also the small number of workers studied with exposure greater than 2 years, the available data offer no indication of variation in individual susceptibility to poisoning although this possibility is not ruled out.

3. All of the reported cases were severe enough for the patients to seek medical aid. Half or more of the patients had convulsions. Although investigators have understandably reserved judgment in some individual cases, the epidemiology of the disease leaves no doubt that most, if not all, of the reported cases represent poisoning. In fact, it is most likely that some cases of real poisoning, especially mild ones, have been misdiagnosed and thus not reported.

4. Mild clinical illness caused by dieldrin poisoning is characterized by the following symptoms: headache (which is frequently persistent and not responsive to drugs), blurred vision, dizziness, slight involuntary muscular movements, sweating, difficulty in sleeping and bad dreams, nausea, and general malaise. (It

**Table 1. Dieldrin poisoning cases in three countries**

| Country | Number of spraymen | Clinical cases | Cases with convulsions | Fatalities | Percent of sprayers poisoned |
|---|---|---|---|---|---|
| Venezuela | 285 | 51 | 22 | 0 | 18 |
| Ecuador | 92 | 8 | [1] 4 | 1 | 9 |
| Nigeria | 40 | [2] 4 | [2] 4 | 0 | 10 |

[1] Possibly underestimated.
[2] One patient had a history of epilepsy.

NOTE: Venezuela—1.25 percent suspension is applied to porous surfaces and a 2.50 percent emulsion is applied to nonabsorbent surfaces at a rate of 1 gm./m.$^2$ in each instance. Ecuador—2.50 percent formulations are used at a rate of 0.5 gm./m$^2$. Nigeria—0.68 percent suspension and emulsion and 1.37 percent suspension are used at rates of 0.27 and 0.54 gm./m$^2$.

**Table 2. Relation of poisoning to duration of exposure to dieldrin, Venezuela [1]**

| Months of exposure | Number of spraymen with stated months of exposure | Number of spraymen at hazard | Cases of poisoning | |
|---|---|---|---|---|
| | | | Number | Percent of those at hazard |
| 0–3.9 | 69 | 285 | 0 | 0 |
| 4–7.9 | 38 | 216 | 5 | 2 |
| 8–11.9 | 26 | 178 | 9 | 5 |
| 12–15.9 | 54 | 152 | 14 | 9 |
| 16–19.9 | 41 | 98 | 13 | 13 |
| 20–23.9 | 45 | 57 | 4 | 7 |
| 24–27.9 | 7 | 12 | 6 | 50 |
| 28–31.9 | 1 | 5 | 0 | 0 |
| 32–35.9 | 0 | 4 | 0 | 0 |
| 36–39.9 | 4 | 4 | 0 | 0 |
| 0–39.9 | 285 | 285 | 51 | 18 |

[1] Modified from Blázquez and Bianchini (*7*).

is entirely possible that other syndromes exist. The poorly defined illness of the European superintendent described by Haworth (*3*) may well be a case in point.)

5. More severe illness is characterized by the symptoms already mentioned and also by stronger jerking of entire muscle groups leading to movement of some part of the body or the limbs or even causing the patient to fall. In extreme cases these movements are accompanied by momentary loss of consciousness.

6. The most severe, nonfatal poisoning observed so far has been characterized by one or more epileptic convulsions with loss of consciousness but without involuntary incontinence of feces or urine. One patient had more than 30 convulsions. Because patients are unconscious during seizures it is likely that some seizures have been overlooked.

7. The circumstances associated with the death of a sprayman in Ecuador are not known except that he was exposed to dieldrin and his illness was characterized by convulsions. (Animal experiments have revealed a form of dieldrin poisoning which, in the absence of treatment, is uniformly fatal. It is marked by convulsions, complete food refusal, and rapid loss of weight. Such poisoning would almost certainly occur in man under certain conditions but has apparently not yet been described.)

8. The convulsions and sudden falls associated with severe illness are of brief duration. Aside from these attacks and the wounds they may produce, signs of illness are not prominent even soon after a convulsion. However, by very careful observation, the following signs may be discovered in many cases of clinical poisoning: slight alteration of reflexes, incoordination (Romberg and other tests), nystagmus, tremor, sweating, dermatographia, and muscular fibrillations (which can sometimes be elicited by striking the muscle or, apparently, by hyperventilation). Occasionally, patients exhibit disorientation or change of personality. Tachycardia and arrhythmia are fairly common.

9. Following removal from exposure, all survivors showed initial improvement. However one patient suffered a recurrence of convulsions 84 days after his last exposure to dieldrin. Some other patients have required as much as 105 days for recovery. In view of these facts and the fact that it has been impossible to follow all cases, it is clear that dieldrin poisoning in man tends to be chronic, but the full extent of the chronicity is not yet known.

10. There is a broad relationship between intensity and duration of exposure, sickness, and the amount of dieldrin in the blood as determined by bioassay. However, the bioassay, as it has been used so far (*6–8*), shows so much individual variation that it is of limited diagnostic value (table 3).

11. Electroencephalograms were abnormal in about half of the clinical cases studied by this method. But the absence of detectable abnormality in many cases, the small degree of abnormality in some other cases, the presence of abnormality in a few unexposed people, and the expense and difficulty of electroencephalography make it of limited value. Detailed information in the tracings has been given by Ducharne (*9*).

Cases clearly involving the ingestion of single doses of dieldrin have not been reported, but such cases have been published in connection with related compounds. Poisoning by aldrin in combination with a solvent was complicated by effects on the liver and especially on the kid-

neys as well as the nervous system (*10*, *11*). Poisoning of more than 59 persons by endrin eaten as a contaminant of bread involved the gastrointestinal system as well as the nervous system (*12*). Clinical recovery following a single dose of these compounds has been prompt, although the electroencephalogram did not return to a normal reading for almost 5 months in the aldrin case. Similar results would be expected if dieldrin were eaten.

### Preclinical Poisoning

An effort to detect preclinical poisoning has been reported by Winthrop and Felice (*13*). A total of 109 spraymen (about half of those employed in Venezuela at the time) were examined. Seventy-two of the 109 spraymen had been exposed to dieldrin for an average of 70 weeks and were currently exposed at the time of examination. Twenty-six of the 109 had been exposed for an average of 30 weeks but had had no contact with the compound for at least 10 weeks prior to the date of examination. In addition to the spraymen, 64 men without occupational exposure to dieldrin but otherwise as nearly comparable to the spraymen as possible were examined as controls.

The following symptoms and signs occurred more frequently in spraymen exposed to dieldrin for an average of 30 or more weeks than in controls: headache, blurred vision, diplopia, tinnitus, dizziness, slight involuntary muscular movements, sweating, difficulty in sleeping and bad dreams, nausea, alteration of reflexes, incoordination, nystagmus, muscular fibrillations, and change in personality.

The parallelism of these symptoms and signs and those associated with clinical illness is remarkable and probably not accidental. It is important to remember, however, that the relationship has not been evaluated either by a statistical analysis of the data collected by Winthrop and Felice or by a practical test. A practical test would consist of an effort to prevent all poisoning severe enough to cause a workman to seek medical care. Serious poisoning could be prevented theoretically if workers were removed completely from dieldrin exposure as soon as they reached some critical level of preclinical effect.

**Table 3. Bioassay index for various groups of workers in Venezuela [1]**

| Group | Range | Mean |
|---|---|---|
| Controls (*5*) | [2] 0 | 0 |
| 7 workers exposed 76 days without clinical illness (*5*) | 0–36 | 16 |
| 9 workers with grade I intoxication (*5*) | 0–90 | 53 |
| 10 workers with grade I intoxication (*6*) | 22–100 | 69 |
| 7 workers with grade III intoxication (*5*) | 0–100 | 71 |
| 16 workers with grade III intoxication (*6*) | 8–100 | 70 |

[1] Recalculated from data of Blázquez and Bianchini (*6*, *7*).
[2] Occasionally the death from natural causes of insects used in the tests will produce an index greater than zero.

The "symptom profile," the "sign profile," and the resulting "profile index" (*13*) are devices for expressing results conveniently and they deserve serious consideration. However, these devices do not test the data. To be of use they must be based on careful examination of the patient. The profile index should be used or modified as convenience and experience dictate. Not necessarily related to the use of this index is the suggestion that technicians could be trained to administer systems reviews and even perform simple neurological examinations. Records obtained by technicians could be interpreted by a physician who would examine thoroughly those spraymen showing progressive or sufficiently serious abnormalities.

About one-third of the spraymen who were not sick showed some abnormality in their electroencephalograms (*9*, *13*). It is of interest that abnormality of the brain waves may continue for more than 4 weeks after the last exposure to dieldrin. However, for reasons outlined above, the test is of limited value. The usefulness of spinal fluid examination in the diagnosis of dieldrin poisoning is not established although the findings justify further study in laboratory animals.

Considerable study has failed to show any value of the following tests in connection with dieldrin poisoning: urinalysis, complete blood study, chest X-ray, determination of visual fields, psychometric tests, or chemical determination of dieldrin in the blood. Dieldrin can

be successfully analyzed after addition to blood in the laboratory (*14*). It may be that the difficulty of chemically analyzing dieldrin in the blood of patients lies in the problem of extraction and purification of the sample. Such problems are well known in connection with the analysis of DDT in blood in contrast to the analysis of DDT in fat.

### Prevention

Many of the papers mentioned above have ended with a list of recommendations regarding spray practices. The recommendations have generally been reasonable. Many of the authors stated flatly that dieldrin can be used safely in an insect control program if the recommendations are carried out. Perhaps this would be true if the recommendations were followed in practice. However, it is necessary to face the fact that (except by discontinuing the regular use of dieldrin) poisoning has not yet been eliminated in connection with any insect control program which gave rise to dieldrin poisoning in the first place.

The limitations of present knowledge of dieldrin poisoning and failure to eliminate such poisoning must be kept in mind. It is equally important to remember that (although complete proof is not yet available) there is evidence that ordinary, careful medical examination by a physician (especially systems review and neurological examination) offers the most sensitive and most practical way of detecting preclinical poisoning. If preclinical poisoning is detected early and affected workers are removed permanently from dieldrin exposure, it may be possible that clinical poisoning can be prevented to a large extent. Furthermore, past failure does not eliminate the possibility that the protection of spraymen and, especially, the uncompromising education of those workers in personal hygiene will greatly reduce the incidence of dieldrin poisoning.

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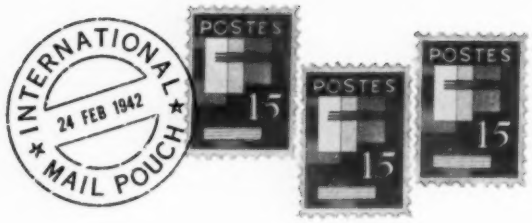


### *Baby Show in Mafrak*

Ninety healthy infants were contestants and 14 received prizes in the baby show held at the clinic at Mafrak, Jordan. Child care is improving from the clinic's system of teaching mothers in groups. This system reaches more mothers and babies than individual instruction.

—ELIZABETH C. HILBORN, *formerly chief nurse, U. S. Operations Mission, Jordan.*

### *Fathers and Sons*

"It was good enough for my father and it's good enough for me" was the gray-bearded village council members' reply when we tried to get them to install a water distribution system.

In the Iranian village where this happened I spoke especially to the few young men on the council. "It is hard to estimate the value of the life of a young child," I said, "but the cost of a water system does not begin to approach it."

Every one of the young men came up to see me after the meeting. Such a thing was good for them, they realized, but they were few and because of their age, had little to say about the running of their village.

In other villages we visited during our trip through Fars Ostan (province) in southwest Iran, we got many requests for water distribution systems. Though some lacked the money to put in a new system we were able to help them with hand pumps or repairs to the old system. Some villages wanted bathhouses, and we promised to come back and make preliminary sketches for drafts to be approved later.

A few years ago persuading people to change their bathing habits was almost impossible, but with newly developing understanding, old customs are changing. For instance, in one village a local contractor building a bathhouse with a common bath, voluntarily switched to a shower system after talking with the district's sanitarian aide.

We made the trip to see the sanitarian aides' work, to persuade municipalities to send employees to the Palasht School of Sanitation, and to encourage towns to spend 0.005 percent of their budgets on health and sanitation.

Several times we visited schools and invariably were asked to question the children. The majority knew the answers to questions such as "Is it better to be clean or dirty?" or "What is the cause of malaria?" and "What should be done about it?" The hope of Iran lies in the young.

—DAVID S. REID, *Shiraz provincial sanitary engineering adviser, U. S. Operations Mission, Iran.*

### *Sergipe's Health Centers*

Ten health centers were opened during a tour the Governor of Sergipe, Dr. Henrique Maia Penido, superintendent of Serviço Especial de Saúde Pública, and I made of this state in northeast Brazil. SESP and the Sergipe Health Department signed a contract only a year ago. Sergipe had never before allocated so much money to health.

In the interest of economy, not one of the centers was constructed from the ground up; some half-finished or vacant building or remodeled home was used. All 10, either separately or in pairs, are staffed by full-time doctors, nurses, and home visitors, an innovation for Sergipe.

—E. ROSS JENNEY, M.D., *chief, Division of Health and Sanitation, U. S. Operations Mission, Brazil.*

### *Vaccination for Chickenpox*

People in Liberia find it hard to understand why we don't vaccinate against chickenpox. Their young children are apt to die from chickenpox complications such as pneumonia or superimposed malaria.

Outbreaks of the disease are often reported as smallpox. When we had no word from our dresser in Kokoyah for several months, the reason given was that he had gone on patrol to vaccinate everyone in his chiefdom against smallpox and chickenpox.

—E. L. MASTHOFF, M.D., *medical officer, U. S. Operations Mission, Liberia.*

# The Role of the Mental Health Service in the Local Health Department

JULIAN G. HANLON, M.S.W.

DRAMATIC changes in mental health programs have occurred throughout the United States during the last decade. Prior to that time, certain States had made significant progress in coping with their mental health problems, but for the most part, the national picture was marked by scarcity of trained personnel, inadequate programs, and a woeful lack of significant research into causes and treatment of mental disorders.

With the passage of the National Mental Health Act of 1946, the picture began to change. Through the National Institute of Mental Health, Public Health Service, funds became available for training mental health personnel in the various disciplines, and there was also a tremendous increase in the funds which could be made available for important psychiatric and mental health research. Included in this new law were provisions for grants to States which enabled them to initiate community mental health programs. Recent legislation provides for mental health project grants for studies of improved methods in the care and treatment of mental patients, and thus we can look forward to constant improvement in our State mental hospital systems, hitherto an almost neglected area. Running parallel to all this, and to a large degree responsible for these advances, has been an awakening of interest by the people of this country. Citizens' mental health groups are demanding that even more attention be paid to mental illness and the prevention of such illness wherever possible.

The mental health service in the local health department is assuming increasing importance in our attempt to deal with these serious, unsolved mental health problems. There are two main reasons why the local health department is important in building the mental health of the community. First, and this is somewhat negative, we now recognize that we must look to local health departments and other nonpsychiatric groups because we will never have enough psychiatric personnel to do the job. By other nonpsychiatric groups I mean various community health and welfare organizations which have an interest in people who are in trouble. Despite 10 years of greatly expanded training in psychiatry, clinical psychology, psychiatric social work, psychiatric and mental health nursing, and a large expenditure of funds, we are still woefully lacking an adequate number of workers in this field.

Second, and certainly more significant, is the reservoir of knowledge, experience, and proved methods public health workers can offer to the mental health field. The psychiatric and ancillary professions are improving their skills in individual treatment and stepping up their efforts to find causes and cures for mental disorders, but there is also a recognized need to go beyond this to the building of improved mental health generally. In order to make a dent in this problem, we must devise ways of working

*Mr. Hanlon is psychiatric social work consultant with the Public Health Service, Region 3, Charlottesville, Va.* *The paper was presented in essentially the same form at the 25th annual meeting of the Southern Branch, American Public Health Association, Asheville, N. C., May 30, 1957.*

effectively with large groups of people. We must think in terms of early case finding and prevention. Is this not the area in which public health workers have labored so long and in which they have achieved such success?

Thus, a local health department has the same responsibility for the mental health of a given community as it does for the community's physical health. The department may of necessity approach the mental health problems of the community in a slightly different way. There may be even greater reliance on other community agencies in carrying out the work. In some communities another agency may have primary responsibility for the mental health program. Nevertheless, the local health department will always be a factor, and a potent one, in the community's efforts to grapple with the mental health problems of its population.

Without laying out a blueprint for an ideal program in mental health for every local health department—the literature contains many descriptions of specific programs—I shall describe a few common situations in which some departments may find themselves and discuss the implications of each in the local mental health program.

### The Psychiatric Clinic

First, let us consider a local health department which is blessed or, as some health officers feel, saddled with a full-time, fully staffed mental health clinic. Probably there has long been pressure in this community to make this service available, and much preliminary work has gone into the establishment of the service, not the least of which was the recruitment of personnel. In these days, a community of modest size that has a full psychiatric clinic team, all present for duty at the same time, can boast of a real achievement. There has been a tremendous effort to increase the number of mental health clinics. Some States have a fairly complete geographic coverage, and service is available either on a full-time or part-time basis even to rural communities, whereas in earlier days only a large urban community had this service. When these clinics were planned they were visualized as a reference point from which the community's mental health program would emanate. Sometimes there was no real clarity as to how all this would come about, and too often those responsible for starting the clinics did not look beyond the organization and the recruitment, which, incidentally, was a difficult task in itself. There was an expectation that certain mental health miracles would take place once these capable individuals were set up in a clinic.

No doubt in many communities the advent of a clinic has provided this reference point. Where the clinic has been located in the health department, it has made this department a center for mental health instead of functioning as a psychiatric service for a limited number of patients needing care. In many instances the addition of a clinic team to the health department staff has meant a broadened mental health-public health approach to community mental health problems, and there is every expectation that this service will bear fruit in the future.

In too many localities, however, results have not always been successful. A clinic starting out in a local health department with much enthusiastic support and bubbling optimism is, after a period of time, too often found to be moving away from instead of toward a broad solution of mental health problems. When the clinic opens its doors, it generally has an original rush of business which swamps the staff. Very early, staff members become deeply involved in situations which seem to require psychiatric treatment. This results, ironically, in the clinic becoming less and less available as a community resource. The staff retires to the relative protection of a long waiting list, which seems to justify how much the clinic was needed in the community. Then we sometimes find a discontent arising within the health department and in the community. The question is asked: "What have we bought?" The service available seems much narrower than public health people have expected, and disillusionment sets in.

There are many reasons for the development of such situations. Some of the difficulty may be due to the method by which these clinics were originally set up. Ordinarily, the State mental health authority, which is the State health department in roughly 32 out of 53 States and Territories, is active in originating

the clinic. And much of the early support comes from State and Federal funds. Perhaps the continuing role of the health officer in relation to the clinic is not made clear enough at this time. He may feel that this is a State operation and while he tacitly agrees to a clinic in his county, he has no real involvement. Thus, from the beginning, especially if there is insufficient planning as to how this service will blend into existing services provided by the local health department and the community at large, the clinic is viewed as an appendage rather than an integral part of the department. Significantly, many of these clinics are not even located physically in the health department building, and this has seemed to me to highlight the separation.

The psychiatric and ancillary personnel share some of the responsibility for this state of affairs. Generally, they are new to the particular community, with little idea as to the community's needs and problems. For the most part, they come with treatment backgrounds, and since they immediately run into the backlog of cases which can profit from their treatment skills, they never fully realize that there can be more to a mental health service in a local health department than seeing a maximum number of perhaps 30 cases for treatment. They are hesitant in moving out into the community, except for a few speaking engagements on general mental health subjects. Perhaps they are too busy and feel they are pilfering this time from their treatment responsibilities, but also they may be uncomfortable in this broad community public health role.

Within the health department itself, members may look on the clinic as merely a treatment resource or as a welcome haven for those psychiatric emergencies which periodically plague the health officer and his staff, and they may be suspicious of any service beyond that. There is little effort to obtain consultation from the clinic group for those aspects of the total health department program which have mental health implications.

The National Institute of Mental Health, with cooperation from States and hundreds of local clinics, has set up a system of clinic statistics which are now collected on a regular basis. This system makes it possible to learn what is being done nationally in outpatient treatment settings. It had been suspected that many of these clinics, set up as community mental health activities, were actually devoting a very small fragment of their time to community work in preference to direct treatment activities. A recent compilation of these statistics verified the truth of this belief. We are not prepared to say at this point what percentage of clinic time should be devoted to community mental health activities, but we believe that it should be higher than our statistics tell us it is at the present time.

Perhaps I appear to be minimizing the importance of the treatment role of the clinics in order to make a point about the different kind of responsibility a clinic takes on in a public health setting. I hasten to emphasize that treatment services are valuable and should be available in every community. What more then do we ask of the health department clinic in its relationship to the local health department? I am certainly not suggesting that, in addition to giving treatment services, the clinic staff set itself up as a group of some sort of "super consultants" in all health department activities. However, the clinic staff and health department personnel should move toward a fuller partnership which will make all of the skills of both groups available to the citizens served by both departments. Mental health personnel can no longer live as boarders in the health department household; they must become active members of the family with all that implies.

Does the clinic have a responsibility and desire to promote mental health through educational methods? The health educator, with years of experience in selling health and health programs, can expand his efforts to include mental health. He can be of invaluable assistance to mental health personnel as they move from their treatment activities into their community role. The difference here as far as health education is concerned is in program content, not in method. Likewise, a psychiatrist who acts as staff consultant in a maternal and child health program, or who works with public health nursing groups on the emotional

components in various illnesses, is thereby a member of the public health staff rather than a walled-off treatment resource for a limited number of cases.

### Departments Without Clinics

But what of the health department which has no mental clinic and which in all probability will never have one? What are its responsibilities in the mental health field? Do we expect it to develop such a program?

I have visited health departments where the health officers make no claim to a fancy mental health program nor do they expect, with the funds available, to have such an organized program in the foreseeable future. These health officers will, however, describe in glowing terms the activities of their well-baby clinics, where, in addition to good physical care, there is time to help parents learn better parent-child relationships. They speak of public health nurses who know their county—its people, its schools, and its teachers—and who are interested in early case finding of children with emotional difficulties. When you discuss all of this in mental health terms, they brush it off and perhaps disavow it as having any connection with mental health. They say this is all "commonsense," and "good public health practice." Whether it is called by any particular name or not, from my point of view, strengthening this kind of service in a local health department leads to improving mental health in the community.

Such strengthening need not wait for the arrival of full-time psychiatric, clinic personnel. It can be propelled along by a health officer who recognizes that he has a broad mental health responsibility. It can be aided by the careful use of occasional consultants for in-service training of staff and evaluation of mental health aspects of certain programs. It can be helped by adding to the staff, from any one of the ordinary psychiatric clinic disciplines, a worker who may bring the knowledge and skills of his specialty to the program and never function in the ordinary, clinical treatment role. In some local health departments, psychologists, social workers, and mental health nurses are operating in this way. This approach can be advanced when the health department is in the forefront in coordinating community resources or where new resources are being set up to meet the needs of the community.

There are many localities without health departments or possibly with part-time men heading the public health program. To talk of a strong mental health program in these departments is unrealistic, for one can only have such a program where basic health services are adequate and strong. As a matter of fact, strong mental health programs are built not only on strong basic health services, but are dependent also on the availability of other community health and welfare services. Some communities have sought a mental health clinic to meet what appeared to be a pressing need, and it has been necessary to advise the community that it might be better to strengthen the health department or add counseling service to the school system, or provide some form of family service in a private family agency. Are we perhaps asking the impossible of a mental health service when we require it to operate without basic health and welfare services?

### Followup Services

Thus far we have looked briefly at the role of the local health department in community education, broad preventive activities, and treatment of early signs of emotional illness. What about that which is referred to as "last ditch service?" We should not discount the role of the health department in providing tangible service to patients entering or leaving the State psychiatric hospitals. Pioneer work in this field has been done in such States as Georgia and Maryland, where public health nurses have been used in an imaginative way in following up these patients. While these programs give indication that they can make a valuable contribution to the care and treatment of mental patients, and while they require continuing evaluation and adaptation, there is no doubt but that there is a place for a local health department to function in this area. Such a program calls for close coordination with the State hospital system with insistence on a clear-

cut line of medical responsibility, more important now with the advent into the community of so many patients on drug therapy.

To some localities this kind of followup seems like a new service, and perhaps in its formal aspects it is. But public health nurses and, in some States, public assistance workers have for years been visiting homes with one or more hospitalized relatives. They have worked with these families before, during, and after hospitalization. The newness in the program is the hospital's awakening interest in what assistance the health department can provide to the hospital in carrying out its responsibilities and to the patient in furthering his adjustment in the community. There must be continued work on the exact nature of the nurse's role. Health departments must know what service the hospital should request from the nurse, and provisions must be made for continued inservice training for the participants so that they are better able to meet the demands which are being made upon them. It means that nurses in health departments will require continuing consultation in the psychiatric and social aspects of these cases. Time and effort spent in this kind of training and consultation will be a worthwhile expenditure since the public health nurse is the department's most effective tie with the entire community.

There is also the responsibility of the local health department for the study of mental health problems in its own local area and for at least modest research into some of these problems. The local health department should also know the adequacy of resources to meet the needs of its people both in the incipient stage of illness and later, and should be able to use its own records and statistics creatively to better determine the needs and the best kind of service which the community should provide. These surveys need only be the simple, descriptive kind of study and reports which come out of the everyday activities of public health workers.

### Conclusion

The health department has an important role in the mental health activities of its community. Clinical treatment of mild cases of emotional disturbance on an outpatient basis is an important community service, but we also recognize that it is only as we approach people's problems on a broader base that we can hope to make a significant contribution toward diminishing the mental health problem.

A mental health program can find room to develop and flourish when it is vested in a strong local health department. Those interested in mental health should see strengthening of their local health departments as a prerequisite to the establishment of their own programs. As pointed out by Charles Mitchell of the Texas State Department of Health, the local health department wishing to make a contribution in the area of mental health must have a deep conviction that since it meets "many people at critical stress periods of their lives, it thereby has an opportunity to affect their mental health favorably." We can only hope that more and more health departments will recognize their potential for so doing.

## Increase in Welfare Expenditures

Public spending for social welfare activities of all kinds increased from $32.2 billion in 1955 to $34.5 billion in fiscal year 1956, largely as a result of the expanding social security program and increased outlays by States and local communities for education. The increased expenditure represented the same proportion, 8.6 percent, of the gross national product as for the previous fiscal year.

Almost three-fifths of the 1956 expenditures ($19.9 billion) came from State and local funds, and a little over two-fifths ($14.6 billion) from Federal funds. The latter figure represented 11.7 percent of the Federal general revenue budget, of which 7 percent was spent on veterans' programs.

# Public Health Awards

## —*Supplemental List*—

HOMER N. CALVER, B.S.

THIS supplemental list of public health awards brings up to date, as of August 15, 1957, the analysis published in the January 1956 issue of *Public Health Reports* (pp. 62–66). Here as there the list includes awards to lay individuals and persons connected with communication media for contributions to public health or the popular understanding thereof. Omitted are the following categories of honors: (*a*) those not primarily intended for services in the field of public health unless a public health worker has as much chance of winning the award as does a member of another profession; (*b*) those given for length of service or length of membership; (*c*) those given for published papers describing research as distinct from those for the research itself; (*d*) those given to former officers and members for service to the organization; (*e*) election to Delta Omega or to other honorary societies; (*f*) scholarships and fellowships; (*g*) honorary lectureships.

One award has been dropped from the list and 18 added (see table). A few minor changes in the original listing are noted below:

- The American Hospital Association Award of Merit is now known as the Distinguished Service Award.
- The Axson-Choppin Award originally restricted to a citizen not connected with a health department is now given to an individual not in full-time employment of an official public health agency.
- The Bell Award trophy is now a plaque.

*Mr. Calver is secretary of the Public Health Committee of the Paper Cup and Container Institute and editor of its Health Officers News Digest. Robert E. Mytinger, assistant to the secretary, tabulated the awards.*

### Public Health Awards Added to the 1956 List

| Name, sponsor, and administrator [1] | Type [2] | Eligibility for award | Basis |
|---|---|---|---|
| **Abel Award.** Eli Lilly & Co. (S). American Society for Pharmacology and Experimental Therapeutics (A). | $1,000 at irregular intervals. | Researchers | Excellence in research for persons under 35 years of age. |
| **Appert Medal.** Institute of Food Technologists, Chicago Section (S, A). | Medal | Members and nonmembers. | Outstanding accomplishments in food technology. |
| **Barton Memorial Award.** Louisiana Public Health Association (S, A). | Certificate | Unrestricted | Significant achievement in research, scholarship or outstanding pioneering performance in public health in Louisiana. |
| **Blackwell (Elizabeth) Medal.** American Medical Women's Association (S, A). | Medal | Members | Distinguished member of the association for contribution to medicine, public welfare, or the association. |
| **Bryant Award.** Texas Public Health Association (S, A). | Scroll and trip to APHA annual meeting. | Unrestricted | Outstanding public health achievements. |

## Public Health Awards Added to the 1956 List—Continued

| Name, sponsor, and administrator[1] | Type[2] | Eligibility for award | Basis |
|---|---|---|---|
| **Formento Memorial Award.** Louisiana Public Health Association (S, A). | Certificate | Individual not in full time employment by official public health agency. | Meritorious activity to foster the program or any phase thereof in any area of Louisiana. |
| **Indiana Public Health Association Award.** Indiana Public Health Association (S, A). | Plaque | Unrestricted | Outstanding service in the field of public health. |
| **Lasker Award.** Albert and Mary Lasker Foundation (S, A). | $2,000, scroll and statuette; 3 per year. | Journalists and commentators. | Outstanding reporting on medical research and public health in newspapers, magazines, radio, TV. |
| **Lasker Award.** Albert and Mary Lasker Foundation (S). Planned Parenthood Federation of America (A). | $500 and scroll; irregular as merited. | Health officers, physicians, administrators, health educators. | Outstanding leadership in furthering the cause of planned parenthood. |
| **Mangold (Outstanding Sanitarian) Award.** National Association of Sanitarians (S, A). | Medallion and plaque to the department for 1 year. | Members | Active environmental sanitarian who has performed duties in an exceptional manner, such as raising the status of the profession. |
| **McCormack Award.** Association of State and Territorial Health Officers (S, A). | Scroll; no set number. | do | Service in public health 25 years or more, at least 10 as State health officer, and with one or more major accomplishments to his credit in administration or research related to public health. |
| **McIver (Pearl) Public Health Nurse Award.** American Nurses Association (S, A). | Medallion; one every 2 years. | Public health nurses. | Outstanding public health nurse. |
| **New Mexico Public Health Association (Public Health Worker) Award.** New Mexico Public Health Association (S, A). | Metal platter | Member of official or voluntary public health unit. | Outstanding service to the cause of public health in the State of New Mexico. |
| **Oklahoma Public Health Association Award.** Oklahoma Public Health Association (S, A). | Plaque | Members | Outstanding work in the field of public health. |
| **Oregon Public Health Association Award.** Oregon Public Health Association (S, A). | do | Individual public health workers, voluntary agency executives, and lay volunteers. | Outstanding contributions in the field of public health in Oregon. |
| **West Virginia Public Health Association Award.** West Virginia Public Health Association (S, A). | do | Public health personnel. | Outstanding achievement for public health in State. |
| **West Virginia Public Health Association Award.** West Virginia Public Health Association (S, A). | do | Any citizen | Outstanding achievement for public health in State. |
| **Winslow, C.-E. A., Award.** Connecticut Public Health Association (S, A). | do | Public health workers and agencies. | Outstanding achievement in public health in Connecticut. |

[1] S—Sponsor; A—Administrator. [2] Except as noted, 1 award is given each year.

• The Crumbine Awards medals are now medallions.

• The Florida Sanitarians Scroll is now the Florida Association of Milk and Food Sanitarians Scroll.

• The Massachusetts Association of Sanitarians Scroll has been discontinued.

• The North Carolina Public Health Association Award citation certificate is now a plaque.

• The Rankin Award trophy has been changed to a plaque.

• The Reynolds Award trophy has been changed to a plaque.

• The Ross Medal given by the National Tuberculosis Association may now be awarded to medical practitioners and scientists as well as to those outside.

• The Shattuck Award originally one award is now approximately six per year.

• The Sippy Award is no longer restricted to the members of the district in which the annual meeting of the Western Branch of the American Public Health Association is held.

• The White Memorial Award plaque has been changed to a scroll and is restricted to a full-time employee of any official health agency instead of to any member of the State department of health.

• The honorarium of the original 3 Lasker Awards has been doubled and 2 more awards, 1 of lesser value, have been set up.

## Reactions to Penicillin

The number of serious reactions to penicillin has been increasing each year according to Dr. Henry Welch, chief, Division of Antibiotics, Food and Drug Administration, reporting before the Fifth Annual Symposium on Antibiotics, October 3, 1957.

A substantially higher number of reactions to penicillin than to other antibiotics were discovered by an FDA survey, the first nationwide study of reactions to the principal antibiotics, covering a period from the latter part of 1953 to early 1957.

The number of reactions to penicillin is still small, Dr. Welch pointed out, when it is considered that millions of persons receive the drug each year and that it has saved tens of thousands of lives. The increased incidence of reactions, he added, is to be expected in the wide use of a highly antigenic substance.

The FDA survey was a geographic sampling of severe cases treated by more than 1,600 private physicians and covered 198,000 of the 685,000 general hospital beds available in this country. The survey was conducted by inspectors in the agency's 16 districts.

In the survey, 3,419 histories of severe reactions to all antibiotics were collected and classified. Of these, 424 were excluded from the tabulation because of insufficient data. One-third of the reported reactions were classified as life-threatening. Of these, 900, the great majority, followed the use of penicillin. More than 600 of the most serious reactions resulted from penicillin by intramuscular injection. In 122 of these cases, penicillin was used in combination with streptomycin and dihydrostreptomycin.

Intramuscular injections were followed by 71 deaths from anaphylactoid shock, the most serious reaction. Anaphylactoid reactions occurred with about equal frequency in both sexes and in all adult age groups. The smallest number of these reactions occurred in children 12 years of age and under.

Although no physicians were found to be using penicillin indiscriminately, Dr. Welch thought that the trend in serious reactions indicated that there should be a clear-cut need before the drug is administered.

The complete report will appear in the December issue of *Antibiotic Medicine and Clinical Therapy*. FDA officials plan other dissemination.

# The Dynamic Approach to Arthritis

EDWARD W. LOWMAN, M.D.

OF all chronic diseases, arthritis is second only to nervous and mental diseases as a cause of illness in the United States (*1*). It causes more years of disability than do all types of accidents and disables seven times as many persons as does cancer (*2*). More than 10 million persons in this country suffer from some type of rheumatic complaint, and 2½ million of these have had to change or stop their work because of their disease (*3*). It is reliably estimated that 147,000 persons in the United States are invalided each year from rheumatic diseases (*4*).

While rheumatic diseases exact a high toll in morbidity, their mortality is extremely low; the reservoir of persons so afflicted is thus ever growing. In the face of the rising incidence of chronic and degenerative diseases, the socioeconomic gravity of this situation is readily apparent. Rheumatic diseases lead all others in crippling and in economic loss. They account for a loss of 97 million man-days and a quarter of a billion dollars in wages annually in the United States (*1*). Finally, it should be remembered that arthritis is not a disease of the aged only, but that it may affect infants and adolescents as well. The two most common and most crippling forms, rheumatoid arthritis and rheumatoid spondylitis, preponderantly affect persons in their third and fourth decades.

Arthritis as a diagnosis is nonspecific; by definition it means "inflammation of a joint." The types of arthritis are legion, probably numbering more than 100, and the treatment and the prognosis vary greatly among these many types. In considering rehabilitation it is important, therefore, that an etiological as well as a pathological diagnosis be established before medical, physical, or vocational measures of treament are undertaken. The majority of cases fall within 7 major categories, and 2 types, rheumatoid and degenerative joint disease, account for 70 percent of the cases (*6*).

Ten years ago, arthritis was a disease of unknown etiologies and of dismally poor treatment prognoses. The introduction of steroid therapy in 1948 catalyzed a renaissance of interest and research that in a decade has developed more basic knowledge, better diagnostic aids, and more effective treatment measures than were developed in the preceding century. While much remains to be learned, great strides have been made. Amidst this optimism of progress has come a change in attitude toward the crippled arthritic, an attitude crystallized by favorable results attained in both physical and vocational rehabilitation studies. Because of these studies, crippled arthritics can no longer be considered negatively as candidates for rehabilitation, for with proper selection and careful treatment many can be salvaged for productive lives (*5*).

As with all chronic diseases, the effects of arthritis ramify far beyond the physical sphere. Though the pathological affliction is primarily one of damage to intra-articular structures, the consequent disability imposes restrictions and demands adjustments in all areas of living: physical, social, economic, psychological, vocational, and recreational. In considering such a patient for rehabilitation, therefore, evaluation and treatment must be directed toward all the many facets of his condition. Proper diag-

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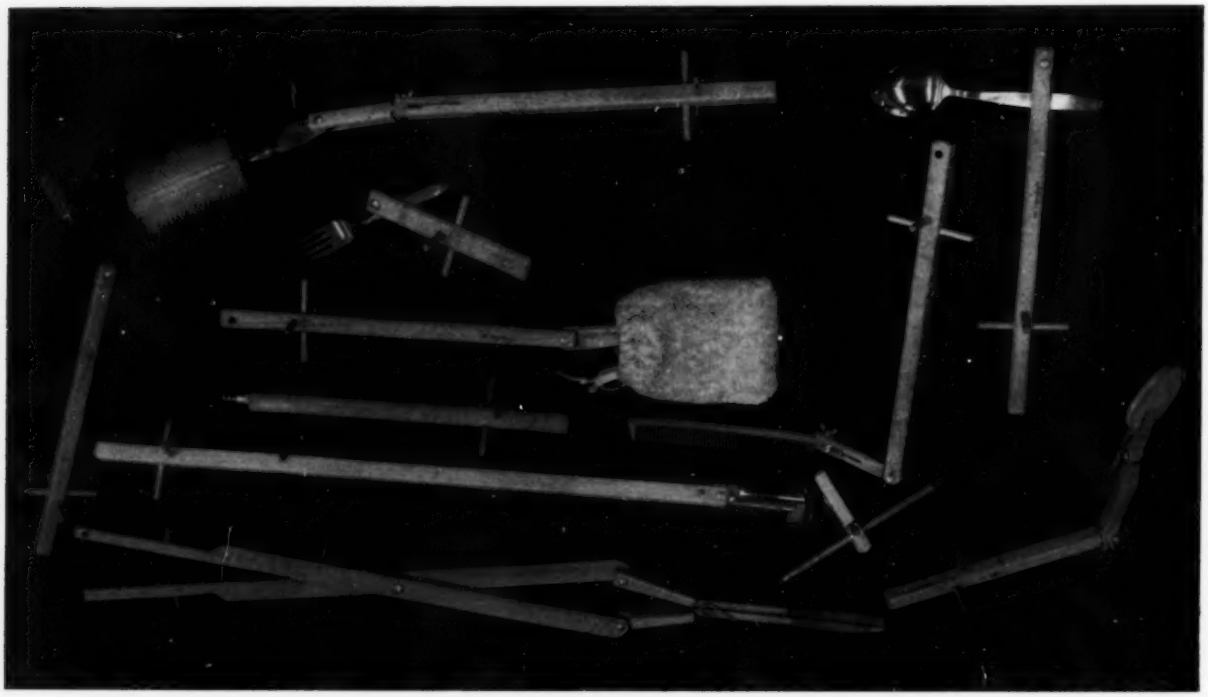
nosis and appropriate medical therapy for control of the arthritic process are, of course, of primary importance. In addition, it is imperative that the patient's functional capacity be assessed and his psychosocial status investigated. Limitation of joint ranges of motion, weakness within muscles, and functional proficiency in the performance of activities essential to independent living must be specifically tested. Further, the psychological, social, economic, and vocational aspects must be studied in detail.

The extent of the problem of rehabilitation for the individual patient, then, is in direct proportion to the deficits in the various areas, and treatment must be directed toward alleviation of these various deficits. Rehabilitation may consist only of proper job placement, or it may involve, for a severely disabled patient, hospitalization and intensive full-day treatment with physical therapy, occupational therapy, remedial exercise, functional training, psychological and psychiatric assistance, vocational guidance, and job retraining.

The degree of success in the rehabilitation of the disabled arthritic is influenced by eight major factors:

*Type of arthritis.* Prognosis varies considerably among the different types of arthritis, which range from the static involvement of a single joint to the fulminating migratory type accompanied by marked systemic manifestations in addition to the joint pathology. These are extremes, but they indicate the wide prognostic variations.

*Extent of damage within joints.* Arthritis results in destructive changes within the involved joints. These changes impair the mechanical integrity of the joint and, in direct proportion to the impairment, modify the tolerance of the joint for physical activity. Since weight-bearing joints are "workhorse" joints, damage to a knee or a hip, for example, will be more restrictive than a similar degree of damage in an elbow or wrist, which is concerned more with dexterity and prehension. Physical activity for a patient must be maintained within the pain tolerance of the joints to prevent further deterioration from overuse. Correction of deformity, especially in weight-bearing joints, building muscle power to a maximum through remedial exercises, and use of braces may often increase a joint's tolerance for activity. The extent of damage, however, remains an important modifying factor.



**Devices with added length enable the arthritic patient to perform many daily self-care activities.**

*Adequacy of medical therapy.* For those types of arthritis that may be improved through medical therapy, the degree to which the process may be controlled directly modifies the rehabilitation goals. Chronic gouty arthritis, for example, can usually be improved considerably through drug therapy. By means of steroid therapy, most cases of rheumatoid arthritis can be partially, if not almost completely, controlled. Disseminated lupus erythematosus, on the other hand, presents a much more complex and difficult treatment problem, and the ineffectiveness of medical treatment may be reflected directly in ineffective total rehabilitation.

*Motivation of the patient.* It is easy to establish goals for an arthritic patient that are compatible with his physical and intellectual capacities, but it is not so easy to know that the goals are within the scope of his motivation. To help the patient develop motivation, every effort should be exerted at the start of a rehabilitation program to give him a thorough understanding of arthritis as a disease, of treatment limitations, and of reasonable goals to be expected, and to instill in him the insight to appreciate that much of what can be accomplished can be done only through hard work and cooperation on his part. Patients who cannot be approached on such realistic ground will be failures in rehabilitation programs and should not be accepted for treatment (*6*).

*Applicability of self-help devices.* Among patients with deformities or restrictions in joints which mechanically prevent the performance of essential functions, it is often possible to bypass such impediments with special gadgets or self-help devices (see illustration). More than 300 special devices are currently available to assist the arthritic in eating, dressing, personal hygiene, ambulation, and transportation (*7*). These range from long-handled combs for patients who cannot reach their heads to motorized wheelchairs for those with arms too crippled to propel a standard wheelchair. The intelligent selection of such devices for the disabled patient often can open wide new vistas of self-sufficiency and independence.

*Functional training.* While joint ranges of motion, muscle power, and the joint's tolerance for activity are rough indexes of a patient's functional capacity, they have no significance unless they can be utilized in performance of function. Functional training, therefore, is an important part of a patient's daily treatment program. The human body as a machine is a grossly inefficient mechanism, probably less than 25 percent efficient. Thus, even in the face of severe mechanical disabilities patients may be trained to a considerably higher degree of efficiency to compensate for irreversible physical deficits.

**An arthritic patient is retrained in ambulation and elevation activities.**

*Corrective orthopedic surgery.* It is no longer felt that arthritic patients should wait for their disease to reach far-advanced stages before being offered the advantages of corrective orthopedic surgery. In fact, from a standpoint of protection of joints against additional mechanical wearing, corrective surgical procedures are at times urgently indicated. The correction of a knee flexion contracture or a hip deformity, for example, may appreciably expand a rehabilitation goal.

*Social, economic, and vocational factors.* Since chronic disease ramifies its effects into all areas of living, total rehabilitation implies assistance in the solution of these facets of the problem. Success depends upon the resources of the patient and the degree of active assistance afforded the patient by the social worker and the vocational counsellor. The most difficult goal to attain in the rehabilitation of the arthritic is job placement. Even in this sphere, however, it has been demonstrated that through careful assessment of psychological and vocational aptitudes, plans for job placement or job retraining compatible with the physical disability can usually be worked out (*8*).


## Summary

The patient disabled with arthritis frequently may be successfully returned to productive and independent living. Rehabilitation, however, must be directed toward the total problem created by the disease. The success of treatment may be predicted in terms of eight major modifying factors. Although a difficult problem, the disabled arthritic is by no means beyond help if he is dynamically dealt with.



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## Public Health Mission to the U.S.S.R.

Five public health physicians from the United States recently spent a month in the U.S.S.R. on an exchange mission headed by Dr. Thomas Parran, dean, Graduate School of Public Health, University of Pittsburgh, and former Surgeon General of the Public Health Service. The visit lasted from August 13 into September of 1957.

Arranged by the Public Health Service in cooperation with the U. S. Department of State, the mission cultivated relationships between public health and medical leaders in both countries.

The itinerary included administrative headquarters, industrial and agricultural health departments, hospitals, urban and rural dispensaries, industrial medical stations, research institutes, and medical schools, in 5 of the 15 republics of the U.S.S.R. in Europe and Asia.

A reciprocal Soviet Union public health mission arrived in the United States in October for a month's stay.

With Dr. Parran on the mission were Dr. Malcolm Merrill, director of public health, California State Department of Public Health; Dr. Otis L. Anderson, Assistant Surgeon General, Public Health Service; Dr. H. van Zile Hyde, chief, Division of International Health, Public Health Service; and Dr. Leonid Snegeriff, associate professor, department of public health practice, Harvard School of Public Health.

# *Poliomyelitis Vaccination Campaign*

About 45 million Americans under 40 years of age have received no poliomyelitis vaccine, and 30 million have yet to complete the full schedule of 3 doses.

"These people," Marion B. Folsom, Secretary of Health, Education, and Welfare, warns, "are needlessly risking disability or even death."

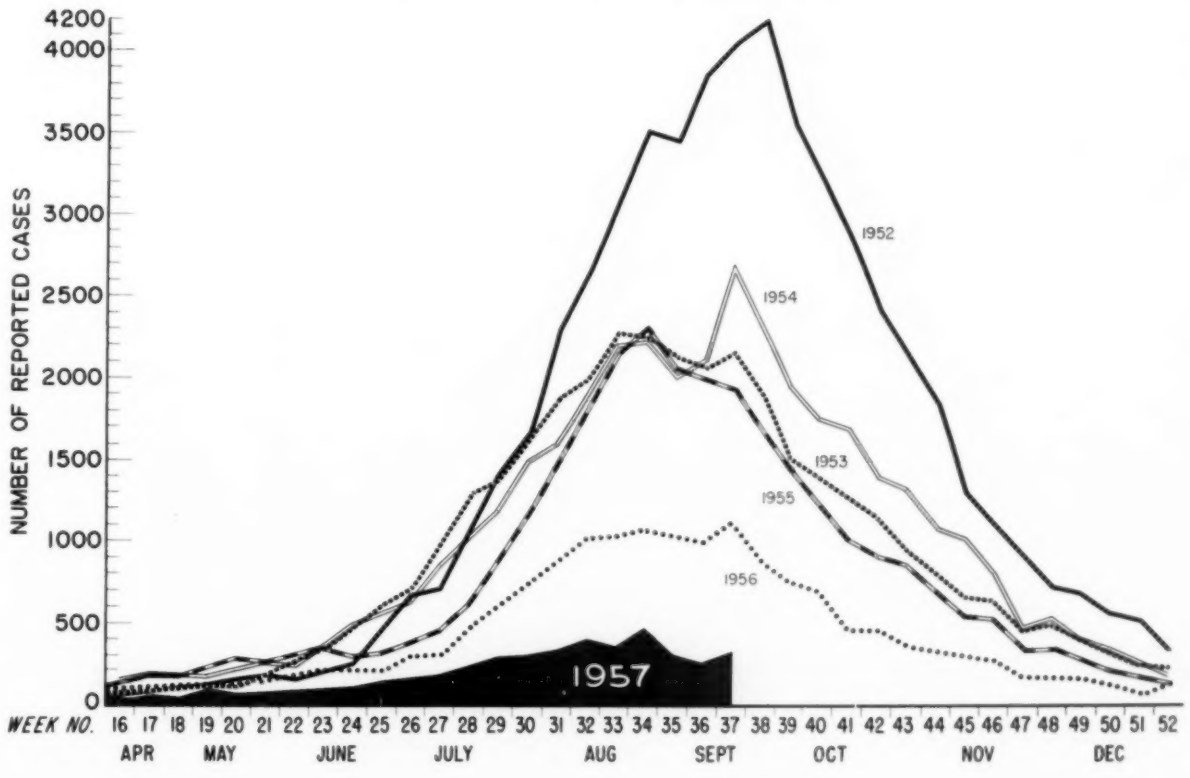
"For many years," Mr. Folsom notes, "this country anxiously sought the means to avert the suffering and anguish caused by poliomyelitis. Today with steadily increasing supplies of Salk vaccine, the means are at hand. If people will use the vaccine available, it is possible to give paralytic poliomyelitis a knockout blow within the next year."

To this end the Public Health Service, the National Foundation for Infantile Paralysis, the American Medical Association, State and Territorial health officers, and the Advertising Council are all joining in a campaign to urge vaccination of as many persons as possible with the full recommended schedule of three doses.

In urging a campaign for vaccination the Secretary pointed out that this is the best time for medical societies, local health departments, schools, industries, and individual citizens and physicians to make sure that everyone who needs protection gets it.

In the fall of 1956 use of the vaccine dropped sharply and supplies piled up in warehouses. By spring the demand rose to such a peak that

**Current poliomyelitis incidence in the United States compared with 1952–56**



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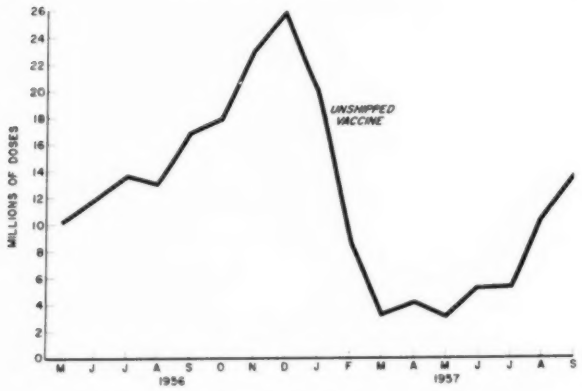
**Manufacturers' reports of unshipped vaccine, by month, 1956 and 1957**




supplies were short again, and many community and industry vaccination programs had to be postponed.

The following summarizes to October 1957 vaccination effects, production, and use.

### Incidence

An 80 percent reduction in paralytic poliomyelitis has occurred in this country since 1955.

During the first 9 months of this year, 1,576 paralytic cases were reported compared with 7,886 cases in 1955, before the widespread use of the Salk vaccine, and 5,241 cases in 1956.

Only 63 cases of paralytic poliomyelitis were reported among the 34 million persons who received 3 shots of vaccine, and not all of these cases have been confirmed.

Although the vaccine is designed to prevent paralytic poliomyelitis, as distinguished from nonparalytic, the total number of poliomyelitis cases this year also shows a sharp reduction. For the first 9 months of 1957 there were 4,851 cases compared with 21,667 for the same period in 1955 and 12,146 in 1956.

### Vaccine Production

More than 215 million cubic centimeters (doses) of vaccine were released for public use between April 1955 and early October 1957. Production is presently 8 to 10 million cubic centimeters a month.

For the first time it now appears possible to have enough vaccine to protect substantially all the population under age 40 before the start of the 1958 season.

### Vaccine Use

Of the Nation's 109 million persons under 40 years of age, more than 64 million had received one or more doses of vaccine. Estimates indicate that of the 63 million in the priority group under age 20, 30 million had received all 3 injections, 15 million had 2 injections, 3 million had 1 injection, and 15 million had received no vaccine. Many in the under-20 age group who still need vaccination are preschool children and teen-agers.

Poliomyelitis can and does strike severely at adults. However, of the 46 million persons 20–39 years old only 16 million had been vaccinated: 4 million with 3 doses, 10 million with 2 doses, and 2 million with 1 dose. But 30 million adults had had no vaccine.

## New Hazardous Substance Law in Texas

A law prohibiting the sale of any substances containing more than 1 percent of any thallium salt went into effect in Texas on August 22, 1957. The new law also forbids the mixture of poisonous substances with food, unless that food has lost its identity as such and is not likely to be mistaken for it.

Passage of the law followed the death of 15 children who had eaten insecticides containing thallium during the year. In November 1956, a 5-year-old girl in Houston died after eating cookie crumbs treated with such an insecticide.

# Environmental Safety for Industrial Uses of Radionuclides

ARTHUR E. GORMAN

IN THIS AGE of seemingly endless technological advances, alert public officials and prudent leaders in industry are coming to realize more and more that they have many common interests, and that in a large measure these interests rest on environmental considerations. Of particular importance to industrial uses of nuclear energy are weather conditions, local and regional topography, geology and hydrology, the influences of tides and currents in coastal waters and estuaries, the physical and chemical characteristics of soils, the surface cover whether in the natural state or cultivated, and the myriads of living organisms which serve to maintain a biological balance in our environment.

These environmental factors have profound influence on whether or not a specific area or region is a desirable place to live. They are also of prime importance in deciding whether or not an area is one where a new industry should be established, and, once established, whether capable of expansion without serious limitations. Such limitations may be those set by management as a result of operating experiences or those applied by public regulatory agencies in the interest of public health and safety or for the protection of natural resources.

The atomic energy industry, born as a wartime expedient and nurtured in strict secrecy is now in its 12th year. It is expanding rapidly. Farsighted leaders in industry and in Congress recognized that this industry would present special problems because of its rapid expansion and the hazardous nature of its products and byproducts. Wisely, they have insisted that precautions be taken to avoid errors made by other industries. What is more important, they have provided funds for research and development in order to appraise factors of public safety and economy.

It is doubtful whether any other major industry has evaluated its impact on people and their environment as has the atomic energy industry. Among the many reasons are the following:

- The products and wastes of the industry are both toxic and radioactive; they therefore present potential hazards to man and his environment.
- The kinds of radioactive materials used are many, and their levels of activity vary widely.
- The period of radioactivity of certain nuclides is so long that special consideration must be given to their storage and disposition and to the effect of these practices on the environment.
- The rapidly advancing technology of the industry on many fronts is presenting problems of expansion and obsolescence.
- The effects on man of exposure to low levels of radiation, especially the cumulative effects, are not precisely determined, although there is general agreement that any dose of radiation to the gonads increases the rate of genetic mutation.
- The staff of regulatory agencies responsible for public health and safety and for protection

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of natural resources are not as yet sufficiently trained in the technology of the industry or sufficiently expert in helping to prevent environmental contamination.

In these circumstances, it is essential that both management and public officials understand and evaluate the relative importance of the various phases of the industry and its products and by-products. Because the demand for expansion of the industry is of deep significance to the economy and defense of nations all over the world, it is vital that no unnecessary blocks be placed in the way of progress. What is called for is a healthy balance between the requirements for public health and safety and the needs of the industry in its inevitable surge forward. Trained manpower is essential to achieve that balance.

## Classification of Nuclear Operations

The hazards of the atomic energy industry are related primarily to the specific activity of the materials used and of the products and by-products developed. It is therefore important that various operations be classified according to their environmental impact. For this discussion, the following classifications will be helpful:

*Mining, handling, and storage of raw ores.* Since radioactive radon gas is given off by raw ores, work areas must be well ventilated and free of dust. Application of well-established hygienic principles for the mining industry should be adequate. Tailings must be handled in such a way that losses to drainage areas will be within reason. This is not difficult since the weight of the ore favors recovery by sedimentation.

*Production of nuclear fuel.* Most of the materials used in the production of nuclear fuel from raw ores or from reclaimed fissionable material have low specific activity and a long half-life. Operations are similar to those in specialized chemical and metallurgical plants. Dusts and fumes must be kept under control. In addition, more than average attention should be given to inplant and offplant monitoring for radioactivity and to disposition of wastes.

*Enrichment of fissionable materials for fuel.* Here again the level of radioactivity is low, and usually the materials have a long half-life. Processing is in various stages, the more important resulting in gaseous fluorides of uranium. Under proper controls, release of fluorine gas and disposition of wastes, as in soluble fluorides, present no serious environmental hazards.

*Research and development.* Research in laboratories, hospitals, and manufacturing plants of various kinds usually uses small amounts of radioactive material, and, for the most part but not always, the levels of radioactivity are low. Research uses are expanding, and the places where radionuclides are used are becoming more numerous and geographically more widespread. Conditions under which radioactive materials are sold for research, however, are such that environmental hazards from this use are likely to be of low order.

*Operation of nuclear reactors.* It is in this area of the industry that materials with high specific activity are employed. The amounts and characteristics of the products and wastes are of importance with respect both to on-site protection of workers and to potential off-site environmental hazards.

Test and research reactors operated at low levels of energy and with small amounts of radioactive fuel are in demand by educational institutions and industry. Designs are conservative and operations are subject to strict regulation. Usually such reactors are a low-order risk from the standpoint of environmental hazards.

Research reactors for testing new designs, new fuels, or new fuel assemblies are a special group and are subject to strict supervision by the Atomic Energy Commission under the terms of their permit from that agency. They are built at areas under AEC control. Examples are the National Reactor Testing Station in Idaho, the Knolls Atomic Power Laboratory, and the Argonne, Brookhaven, and Oak Ridge National Laboratories.

Reactors for testing materials and facilities, for producing fissionable material or for developing power experimentally, or for commercial use constitute the major environmental hazards. Their design and construction are subject to thoroughly critical review and their operations

are rigidly controlled. These reactors use substantial amounts of fissionable materials. Usually they are operated at high power levels, and the amount of heat generated may be prodigious. Examples of such reactors are the materials-testing reactor (MTS) at the National Reactor Testing Station, the production reactors at the Hanford Works in Washington and at the Savannah River Works in South Carolina, and the pressurized water reactor for power production now nearing completion at Shippingport, Pa.

*Processing irradiated fuels.* Chemical processing plants are necessary to separate unspent reactor fuel from fission products created as a result of neutron bombardment of fissionable material in the reactors. Large plants of this kind are operated, under AEC control, at the Savannah River and Hanford Works and at the National Reactor Testing Station.

### Site Selection

Selection of a site for an atomic energy plant is one of the most important decisions management has to make. The site profoundly affects factors important in company policy, finance, and public relations. Among these are layout and design of structures and facilities, pattern of future expansion, day-to-day operations, and safety of employees or persons and property in the vicinity of the plant.

In the atomic energy industry, perhaps more than in any other, decisions as to a plant site focus largely on anticipations of the character and quantities of wastes to be released. This is particularly true for nuclear reactors and associated chemical processing plants where levels of radioactivity in product and wastes are high. With modifications, it also holds for feed material processing and nuclear fuel fabricating plants, research laboratories, and other places, where materials used have lower levels of radioactivity.

During World War II, the Government-owned atomic energy plants were located in areas of relatively low average population density. Sites were selected partly for reasons of security, but also because of availability of power and water. Since then, there has been opportunity to evaluate performance and practice. New plants have been built and old ones have been refitted. Much has been learned which now can be put to peaceful service.

With relaxation of security regulations concerning technical information and authorization for wider uses of nuclear materials given in the 1954 Atomic Energy Act, the interests of private industry in exploring the opportunity to use atomic energy have been pronounced. It seems likely that since these ventures will be organized and financed in an open competitive field, corporations will prefer to locate plants at strategic places in relation to the market and reasonably near populated areas. When it seeks a site for this new enterprise, a company wishing to build a plant to use atomic energy or to manufacture a product using radioactive materials must face up to its responsibilities.

One of the first considerations will be the possible concern of citizens of nearby communities as to hazards, real or imaginary, an atomic energy plant may bring to the area. Sometimes public officials may not accord an atomic energy plant the welcome they normally extend to a new industry, for they may be concerned over the future effects of this industry on the health of the people and the safety of the environment of their communities. This attitude is entirely understandable.

Experience has shown that the greatest concern of public officials over the location of atomic energy plants in their jurisdiction pertains to storage, release, or disposition of radioactive wastes. The interest that the public now shows in clean streams, preservation of recreational areas, protection of surface and underground sources of water supply, and clean air is a sign of progress in environmental sanitation. It may also be a portent of trouble for any industry so shortsighted as not to plan to meet reasonable requirements to reduce hazards related to disposition of its wastes. On the other hand, unreasonable demands on industry in the degree of waste restriction could seriously affect the interest of the industry and the community or region under consideration.

Radioactive wastes may be in the form of solids, liquids, or gases, and at times they may be in intermediate states as colloids. Problems associated with disposition of radioactive wastes are unique. The effects of radiation can

be immediate or delayed. Radiation is an insidious contaminant with cumulative damaging effects on living cells. Certain highly active radionuclides continue to give off energy over long periods of time, to persist through many generations. These are facts of deep importance in evaluating risks and in establishing protection against them. They must never be forgotten in selecting a plant site, and in planning or practicing disposition of radioactive wastes.

### High-Level Wastes

High-level wastes may contain as much as $10^2$ curies of radioactivity per liter. In normal operations, their principal source is in the processing of irradiated fuel elements. The cost of treatment and disposition of these wastes is high. If nuclear power is to compete with other fuels, cheaper methods of waste disposition must be found. Cutting of costs must be done intelligently; unsound economies may introduce risks of environmental contamination.

Disposition policies are especially important with regard to high-level radioactive wastes that contain long-lived and biologically significant fission products, such as strontium-90 and cesium-137, and others with shorter half-lives, such as cerium-144 and ruthenium-103, and certain isotopes of rare earths, that may be difficult to control when released to soils.

#### *Fixation on Soils*

Nature provides some important potentialities for resolving environmental problems. These are being studied in order that they may be taken advantage of in reducing the cost of disposition of wastes from reactors and plants for chemical processing of spent fuels from other sources. Fortunately certain soils and the suspended and bed loading of most waterways have properties of absorption or adsorption of radioactivity. The exchange capacities of soils for radionuclides can be affected seriously by nonradioactive ions in wastes. This complex should be fully evaluated in deciding on the degree of pretreatment required before wastes are disposed to the ground. The heat in high-level wastes resulting from gamma radiation introduces an important problem in the disposition of these wastes. Research in ground disposition of wastes is under intensive investigation by the Oak Ridge National Laboratory, with the cooperation of the Earth Sciences Division of the National Research Council, and at several other AEC installations, notably at the Hanford Works.

The requirements of environmental protection could be met by fixing radioactivity in columns of selected and pretreated clays or other suitable material and then raising the temperature sufficiently to form a solid ceramic mass from which the wastes could not be elutriated or leached. Such a mass could then be stored in a selected area or be buried in a tight soil designated by a geologist as suitable for waste storage. Research to determine feasibility and cost of such a method is under way at the Brookhaven and Oak Ridge National Laboratories and the Los Alamos Scientific Laboratory.

#### *Ground Storage*

Two methods of ground storage may be feasible for highly radioactive liquid wastes. One is by pumping these wastes into cavities dissolved in deep salt deposits or salt domes. The other is by pretreating the wastes at the surface and then pumping them to the connate brines in closed basins at great depth and in areas where natural resources would not be unfavorably affected. The potentialities of each method are attractive, but much research must be carried out before it can be established that either is economically feasible and safe or even acceptable to responsible regulatory agencies.

Should either or both of these methods prove satisfactory, the presence of suitable deep strata would be an important factor in selecting a site for a chemical processing plant. It is conceivable that in the future the production of fission products will outrun the demand for selected radionuclides in wastes for use as radiation sources. In that event, disposition of high-level wastes from chemical processing plants directly to deep strata would have considerable advantage over the present practice of storing radioactive wastes in tanks near the surface.

Another possibility for lessening the environmental hazards associated with storage of high-

level radioactive wastes is to remove the long-lived and biologically significant nuclides from the wastes prior to disposition. If this were done, wastes could be disposed to the ground in selected areas with greatly reduced environmental hazards. Almost complete removal of the high-level radionuclides, more than 99 percent, would be necessary.

*Land Burial and Tank Storage*

Land burial is an economically attractive method of disposing of solid radioactive wastes, but it presents serious environmental problems. An experienced geologist must assist in selecting burial grounds. Burial grounds should be fenced and well identified. They should be kept to a minimum in number since they may become so contaminated as to be unfit for any other use.

Underground storage in tanks without fixation of the high-level, long-lived radionuclides could affect the health of future generations. Tanks containing radioactive wastes, as well as waste burial grounds, should be located so that if leakage occurs pollution of ground water will be minimized. Preferably tanks should be set well above the water table and in tight soils from which movement of any leakage would be slow. Storage areas should be monitored periodically to detect any leaks.

Tank storage is not a final solution of the waste problem. The wastes may be radioactive for a century or more whereas the tanks in which they are stored may be expected to corrode and leak within decades. Therefore, this method of disposition obviously permits a potential environmental hazard to persist, even though transfer from old to new tanks is possible.

Storage of high-level radioactive wastes in underground tanks as currently practiced has the advantage of confining the wastes and of allowing time for decay of radioactivity. But provisions to remove heat from tanks often are required, and the method is costly.

### Low-Level Wastes

Release of low-level radioactive wastes, whose activity is $10^3$ or $10^4$ in excess of permissible long-term limits of exposure, may also produce an environmental hazard. Because the quantities of these wastes are large, release to the atmosphere, surface waterways, or the ground is economically attractive and has possibilities if conditions are favorable for dilution.

Extensive research in determining the significant parameters for appraisals of favorable dilution factors in nature is being carried out under Atomic Energy Commission contracts with the Weather Bureau, the Geological Survey, and several universities. Staff of AEC and its operating contractors at the Hanford Works, the Knolls Atomic Power Laboratory, the National Reactor Testing Station in Idaho, and the Brookhaven, Argonne, and Oak Ridge National Laboratories are conducting similar research.

### Remote Locations

Within the next decade atomic energy plants may be built in remote places throughout the world where the need for power is so important that the factor of cost or the competitive price of solid fuels may not be significant. Here again the industry has a real obligation to maintain high standards of safety and environmental sanitation. Even though initially exposure of people and property in such areas may be slight, a reckless attitude toward disposition of long-lived wastes should not be permitted. With advancement in travel and transport to these areas and perhaps unpredictable uses of their natural resources, careless practices in this generation in the interest of low costs could preempt use of these resources by future generations. History is replete with examples of the penalties paid by subsequent generations for the reckless, uncontrolled actions of their forefathers.

### Plant Expansion

In site selection, serious consideration should be given to the possibility or probability that a plant as originally built may be enlarged or its functional processes changed with relatively greater hazard. When a plant or site planned for one purpose is put to another use, it is important that such basic services as utilities, waste systems, and points of release of waste

effluents be restudied to ascertain their adequacy for the new use. Modification should be discussed with public officials responsible for public health and safety. If the original plant is served by public utilities, such as water, power, and sewers, this obligation is all the more pressing.

Selection of a site for an atomic energy plant calls for the integrated judgment of competent people from a variety of professions. These might include nuclear and health physicists, biophysicists, physical and nuclear chemists, structural and ground water geologists, nuclear, chemical, sanitary, and safety engineers, industrial hygienists, ceramists, biologists, mineralogists and soil scientists, meteorologists, hydrologists, public planners, and others. Important among the assignments on which these specialists should assist are:

- Selection of sites for various units of a plant, making the best use of area topography and environmental conditions.
- Availability of water for processing and for domestic uses.
- Type, capacity, and location of waste storage and treatment facilities.
- Degree of waste treatment required initially and later in a progressive expansion program.
- Points and methods of discharge of waste effluents.
- Sites for burial grounds for radioactive and toxic wastes.
- Dilution factors in nature which could be used in disposition of wastes.
- Selection of monitoring points for establishing information on background radiation and subsequently the effect of day-to-day operations on background.
- Development of program for evaluating environmental hazards in the event of a serious accident or spill and for notifying public officials promptly so that proper warning may be given to off-site populations and industries.

Under normal operations, waste products from a reactor or chemical processing plant operating on a continuing basis can be predicted and a program for on-site decontamination planned so that the ultimate dilution of radioactive gaseous or liquid effluents released will be such as to protect against environmental exposures of significance. But in selecting a site for such plants, it would be unrealistic to assume that operations will always be normal. In evaluating environmental hazards, it would be prudent to accept certain pessimistic positions.

Management of most industries seeks insurance against accidents that may affect employees, plants and facilities, and lives and property in the environs of the plants. Insurance in connection with atomic energy plants is complex. Experience is too limited to establish the probability of occurrence of a major accident. The gross potentialities of an accident and its aftermath, especially for reactors and chemical processing plants, are reasons for concern. (The 85th Congress approved insurance up to $500 million a risk against reactor accidents above the $65 million which private insurance companies are prepared to underwrite. The damage from a reactor accident is estimated by AEC to be in the billion dollar range.)

The alternative to selecting a remote site to reduce the possibility of exposing off-site populations to radiation should an accident occur is to confine the reactor within a tight shell strong enough to withstand an explosion and prevent escape of fission products and other hazardous materials. An example is the steel sphere 225 feet in diameter and nearly an inch thick which encloses the submarine test reactor at West Milton, N. Y. The cost of providing such protection for a small research reactor or a large power reactor may be less than the cost of locating the facility a great distance from the area the reactor is to serve.

Careful planning is needed if plants for the use of atomic energy for peaceful purposes are to be built near populated areas. This new industry must avoid the mistakes of other great industrial enterprises in which early enthusiasm for expansion shaded judgment.


NEARLY 2,000 physicians, radiologists who specialize in the diagnostic and therapeutic use of ionizing radiations, met in Washington on October 1–4, 1957, to discuss methods of protecting patients against unnecessary exposure to radiation.

The occasion was the 58th annual meeting of the American Roentgen Ray Society. In addition to the theme of radiation protection, the meeting offered papers on other scientific subjects, postgraduate refresher courses, and many scientific exhibits.

The annual Caldwell lecture was delivered by Dr. Eugene P. Pendergrass, professor of radiology at the University of Pennsylvania, on the subject, Atmospheric Pollutants and the Radiologist.

Dr. Wendell G. Scott, incoming president of the American Roentgen Ray Society, listed five questions which a patient might ask his doctor in advance of X-ray studies.

1. Is the examination necessary? (Let the doctor determine this: it is his responsibility.)

2. What physician is to make the examination?

3. Has the examining physician, if other than a radiologist, received formal training in radiology? If so, how much, and will there be a written report of the examination acceptable to other physicians?

4. Is the technician who will assist in the X-ray examination certified or qualified by formal training?

5. Would you choose your surgeon without asking similar questions? (Physicians who make radiological examinations should be selected with the same care.)

### Training Recommended

Dr. Scott, professor of clinical radiology at the school of medicine at Washington University, St. Louis, emphasized the need for more training in radiobiology and in the proper use of radiation for medical students, internes, residents, and postgraduate courses for practicing physicians.

"Nobody wants to do away with the diagnostic X-ray," he said. "It is the unnecessary examination and those poorly performed by physicians, osteopaths, chiropractors, naturopaths, or even radiologists that are to be con-

demned." He denounced the situation that permits any practitioner without training or experience to obtain and use X-ray equipment for any examination he may choose.

Only the radiologists are certified specialists in this field and then only after 3 additional years of training and successful completion of examinations by the American Board of Radiology.

### Reforms Proposed

He deplored situations which fail to provide protection to personnel and to those working in offices adjacent to the X-ray equipment with monitoring devices and sufficient radiation shielding in the walls and floors. They occur too commonly. He condemned routine fluoroscopy of infants and children and advised that X-ray pelvimetric examination of pregnant women should be used only when the indications are urgent, in view of the possible injury to the maternal gonads and the fetus. He also criticized health insurance plans which, by allowing $25 worth of diagnostic X-rays each year, encourage unnecessary radiographic examinations and thus unnecessary radiation exposure. Careless and unscrupulous use of X-ray examinations, he said, is as reprehensible as fee-splitting and will be weeded out by courageous action by the medical profession.

The limits established for occupational exposure have been reduced progressively over the last 20 years.

### Panel Summary

Summarizing the discussion of a panel of authorities on radiation hazards, Dr. Richard H. Chamberlain, University of Pennsylvania Hospital, Philadelphia, a member of the International Commission on Radiological Units, said:

"The well-known and generally accepted facts about radiation deserve frequent repetition. They have been the theme of national and international recommendations, of numerous contributions to scientific journals, and of our teaching.

"There has been some distortion and misplaced emphasis as to the extent of hazards in medical radiation, but there has also been reasonable advice on some radiation precautions."

He summarized the familiar facts in somewhat the following form:

- Hazards of radiation are real.
- Dosage should be kept low.
- Education and experience are needed to appraise need of exposure and to control dose.
- Radiation techniques have been improved to reduce hazards.
- Radiological practice needs constant review and improvement.

Less familiar and newer points about radiology he mentioned were in essence:

- The lowest doses have some genetic effect, according to geneticists' estimates.
- Life shortening effects of radiation warrant consideration. Though not excessive, they cannot be ignored.
- Infants, children, and pregnant women should have more protection against radiation than older persons.
- Medical uses of radiation are increasing and are a public as well as a personal concern.
- The amount of population exposure is not known; its study must be comprehensive.
- Exposure to medical and dental radiation can be reduced without reducing diagnostic and therapeutic uses of radiation.

Conclusions based on the panel discussion included the following:

There is no disposition to abandon specific medical uses of radiology; rather, the needs and indications for each medical radiological procedure should be weighed against the hazards.

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***If the Shoe Does Not Fit . . .***

**"The exposure of human beings to any unnecessary radiation is not to be encouraged; when no benefit can be expected, some exposures can be categorically forbidden. A situation of this type exists in the use of X-ray fluoroscopes for shoe-fitting, inasmuch as competent orthopedic authorities state that no benefit is to be achieved by their use in fitting shoes."**

—RICHARD H. CHAMBERLAIN, M.D., *Journal of the American Medical Association, October 3, 1953, p. 488.*

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It has not been suggested that the total number of examinations is too high; increased use of radiological diagnosis is reasonably possible within a reduced total radiation exposure.

Provided they adhere to protective practices, radiologists and their associates need not have excessive concern for their longevity or injury.

It is not recommended that every individual carry a diary of exposure. Limited and controlled statistical studies, however, may well furnish needed scientific information for the future.

Exact values cannot yet be assigned to the precise individual risks of the absorption of a given amount of radiation in a specified volume of tissue. Even less attainable is a measured value for the beneficial returns associated with such exposure.

Dr. Chamberlain advised that radiation protection is less to be achieved "by legislation or rigid rules, by exhortation, or even fear," than by "the individual mind which employs wisdom, experience, and common sense."

Lauriston S. Taylor, chief of atomic and radiation physics in the National Bureau of Standards and chairman of the National Committee on Radiation Protection and Measurement, emphasized to the panel that most of the good advice necessary for protecting patients from unwarranted exposure in radiological diagnosis has been available for years, but some people have not been paying attention.

He summarized the essential information as follows:

The X-ray machine should be tested periodically for leakages and output. At least 2½ millimeters of aluminum should be used in order to "filter out" unnecessary radiation in diagnosis.

More efficient higher kilovoltage should be used with X-ray equipment, with lower milliamperes per second. This technique produces equivalent diagnostic X-ray films with less radiation for the patient.

Active chemicals and proper temperature should be used in the full-time development of films, so as to eliminate needless repeat studies.

Fluoroscopy, an X-ray technique that allows the doctor to see internal structures "in action," should be used to observe motion and function; the fluoroscope should not be used in screening.

The radiologist should adapt his eyes to darkness 20 minutes before fluoroscopy, and should always wear protective gloves and apron.

The equipment should have effective shutters which cut down to a minimum that part of the patient's anatomy under study; and in taking X-ray films, field-limiting cones and diaphragms should be used as much as possible.

Taylor's advice was elaborated by Dr. John S. Laughlin, Memorial Center, New York City, who also offered evidence of the degrees of exposure produced by various examinations. Dr. Laughlin reported measurements of bone marrow dose in chest examinations which indicated that photofluorography produced a bone marrow dose about that produced by natural background, and that chest radiography produced a bone marrow dose approximately 10 times less. (See table for estimates of gonadal and bone marrow dose received annually from natural background.)

"Subject always to the requirement of a film adequate for diagnosis, the following factors can result in appreciable reductions of patient exposure: Use of an adjustable diaphragm to obtain the smallest field size necessary; use of

**Estimated annual dose from natural background**

| Radiation source | Gonadal | | Bone marrow | |
|---|---|---|---|---|
| | Millirad | Millirem | Millirad | Millirem |
| Cosmic rays | 26 ± 3 | 26 ± 3 | 26 ± 3 | 26 ± 3 |
| Earth, housing | 53 ± 20 | 53 ± 20 | 59 ± 20 | 59 ± 20 |
| Atmospheric | 2 ± 1 | 2 ± 1 | | |
| Internal radioactivity: | | | | |
| Beta and gamma rays | 18 ± 3 | 18 ± 3 | 5 ± 1 | 5 ± 1 |
| Alpha particles | 0.5 ± 0.3 | 5 ± 3 | 4.5 ± 2 | 45 ± 20 |
| Total | | 104 ± 21 | | 135 ± 30 |

either heavy filtration or high voltage or both; use of scrotum shields or pelvic girdles; use of fast film and optimum developing chemicals and temperatures; and the use of image intensification where feasible," Dr. Laughlin emphasized.

### Dose Measurement

Dr. Laughlin was concerned particularly with the complex problem of accurate measurement of dosage of radiation absorbed by the patient (fig. 1). "Because of the pronounced variation among different procedures of radiology," he said, "a given procedure cannot be represented by a single gonad dose value which will have a general application. However, if one assumes that a range of valid gonadal dose values can be assigned to a given procedure for patients of a given age and sex and for different categories of practice, certain additional statistics are necessary to obtain an approximate estimate of the total gonadal dose." (A scientific exhibit at the meeting demonstrated the use of an electronic computer to determine dosage.)

### Improved Equipment

Although the radiologist is moving in the direction of better diagnosis with less radiation exposure, by use of image amplifiers, fast developers, and sensitive film, Dr. Laughlin looked for industry to extend such developments by its own research.

The size of the field, that is, the extent of the anatomy undergoing examination, and the X-ray beam should be checked on all X-ray units to avoid exposure to irrelevant parts of the body, he cautioned. He recommended a lead-lined girdle to shield the patient's reproductive organs.

Several physicians commented on practical methods of reducing exposure.

An ultra-short timer is used to reduce exposure by Dr. Barton R. Young of Germantown Hospital, Philadelphia. It has a diagnostic advantage in angiocardiography, too, he said, because it catches the structure of the heart and opacified blood in motion, quite as a fast photograph stops or freezes rapid motion; and this is done with normal breathing and freedom from restraint of the patient. The ultra-fast timer uses 1/1000th of a second in contrast to the usual period of 1/120th of a second.

An X-ray intensifying screen, utilizing thallium activated potassium iodide, was described by Dr. Michel Ter-Pogossian of Mallinckrodt Institute of Radiology, St. Louis. The screen reduces exposure by a factor of about four because of a more efficient utilization of the photon energy. It also permits a 50 percent reduction of the contrast material used in cerebral angiography.

### Dental X-rays

One of the speakers said that the School of Dentistry at the University of California, by using high kilovoltage, small well-defined beams, long distance, and fast films, has been able to obtain a full-mouth examination by X-ray with an exposure of less than five roentgens (r) to the jaw. Currently, exposure for such a diagnosis can be as much as 300 r to the cheek and jaw. The School of Dentistry also uses a lead apron to shield patients under 30 years of age.

### Vita Brevis?

With respect to the life expectancy of radiologists, Dr. Carl B. Braestrup of Frances Delafield Hospital, New York, noted that published reports of statistical studies related for the most part to physicians who practiced radiology when the hazards were great and the protective practices inferior to those today. Recent monitoring, he asserted, indicates that the average exposure to any major part of the radiologist's body today is well below the limit of 100 milliroentgens per week.

However, he said there is still need to improve safety practices related to fluoroscopy. He expressed the hope that new equipment would apply better protection at the source against secondary radiation.

For the present, safety depends mainly on shielding the person to be protected. Radiologists using unprotected equipment, he said, probably absorbed doses of the order of 100 r to the whole body in a year. With present standards, the yearly dose is reduced to 1 r, he estimated.

A different estimate was offered by Dr. Gioac-

chino Failla of New York City, who set the probable dose to a radiologist for 42 years, from age 18 to age 60, at 210 r, given modern protective methods. This much absorbed radiation, he estimated, would shorten life expectancy by about 8 months, in contrast to earlier studies which indicated that radiologists had a life about 5 years shorter than the average physician. An absorbed dose of one roentgen accumulated over a long period by the body as a whole, said Dr. Failla, shortens life by only 1 day, in contrast with earlier estimates of 15 days per roentgen.

He recommended, however, that radiologists should reduce their cumulative exposure to less than 210 r.

His remarks were limited to a discussion of chronic exposure at low dosage rates. Entirely different conclusions are drawn from studies of effects of large doses received in a short time. (An acute dose in the range of 400–500 r over the whole body results in death within 30 days to half of those so exposed. The life of the others exposed would be materially shortened.)

### Genetic Defects

Apart from the effects on longevity, physicians should concern themselves with the effects of radiation on future generations, cautioned Dr. Bentley Glass of Johns Hopkins University, Baltimore.

Any radiation absorbed by the gonads, he states, is likely to produce some effect on the descendants of those exposed. These effects are produced by changes of genes in the chromosomes which shape the anatomy and control the metabolism of the organism. Usually, a gene dies when it absorbs radiation, but those that survive, as mutations, are likely to be defective. Once in a population, the defect persists until the carriers fail to reproduce or it is excluded by chance from their progeny.

Typically, radiation-induced mutations produce no visible abnormality, even in the progeny, but only a slight reduction of life expectancy, a decrease in fertility, an increase in illness, and other nonspecific effects.

There is no sign, he said, that any dose will fail to produce such mutations. Even the

**Figure 1.** Sectioned phantom (left) of a young adult body is made of unit density pressed wood. It encloses an entire human skeleton which shows white in the radiograph (right). The absorptive character of the pressed wood and its beeswax and cork filling approximates that of skin, flesh, and musculature. The radiograph of the phantom shows the position of dosimeters at 3 points in the skeleton. The dosimeters register approximately the amount of radiation that would be absorbed by the bone marrow given controlled amounts of external exposure to gamma radiation or X-ray. Experimental readings of this kind are used to compute how much of an external radiation dose is absorbed at various points or in strategic tissues within a living body.

lowest doses produce mutations in proportion. And all doses to the gonads, from conception to the end of fertility, add to the total burden of mutations the population must carry.

Unlike spontaneous mutations, mutations produced by radiation are rarely if ever known to revert to the earlier form, he said.

The gonadal dose to the United States population per generation he estimated to be within a range of 1 to 8 r. This would mean that after 1,000 years, out of 4,000,000 babies born annually, there would be tangible genetic defects in from 1,000 to 64,000 (most probably 8,000). The probable figure, 8,000, is a 10 percent increase over the number of spontaneous defectives produced annually. In the first generation, he said, for a period of 30 years, the annual increment of defectives caused by radiation would most probably be 800.

### Weighed in Balance

Such consequences of radiation exposure were balanced in the discussion against increases in life expectancy and improvements in medical practice, attributable in part to radiological diagnosis and therapy which has been increasing in application. The trend to increase use of radiological diagnosis and therapy is illustrated in figure 2.

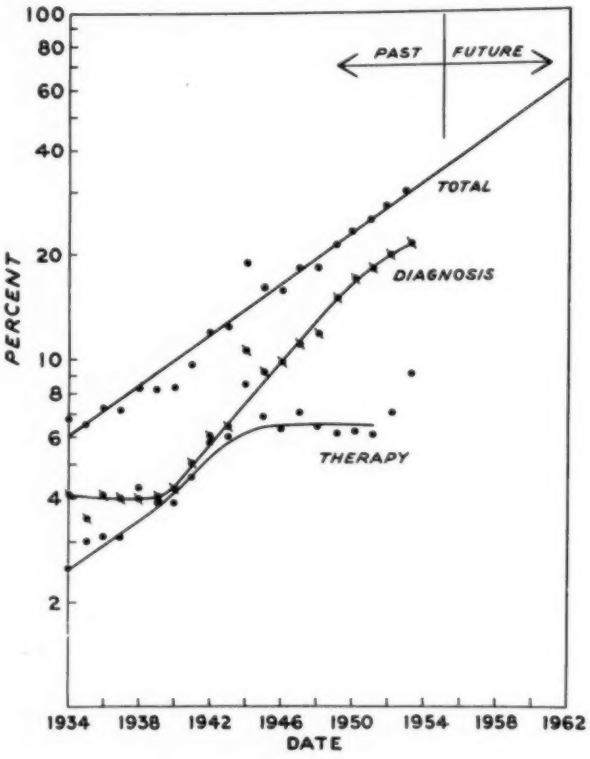
The genetic hazard was viewed in the perspective of a decline in infant mortality from 99.9 per 1,000 live births in 1915 to 26.4 in 1955. Radiation hazards were contrasted with motor vehicle accidents which cost 38,426 lives in the United States in 1955.

At the same time, speakers urged proper use of radiological terms. Too often, it was said, statements about exposure make no reference to the numbers, kinds, or volumes of tissues exposed.

In avoiding unwarranted exposure of a patient to medical radiation, it was agreed, the physician must be aware of the risks, so that he will ask whether there is a way of reaching a correct diagnosis other than by X-ray, especially when the patients concerned are children, pregnant women, women in the child-bearing period, and men under 40.

In criticism of the fluoroscopic examination of well babies on their periodic visits to their

**Figure 2. Percentage of hospital and clinic patients using radiological services, University of California Medical Center.**




pediatricians, it was said that such examinations include, almost as a routine, direct exposure of the gonads, and frequently the physician does not know the rate of exposure of the machine.

Pelvic examination was said to contribute as much as 20 percent of the genetically significant radiation in the population. Such examinations expose to radiation the gonads of the mother and child and, in early pregnancy, may affect the embryo. "They should not be done unless there is a threat to the health of the patient," one speaker stated. "If a pelvic study is necessary in the opinion of the obstetrician, it should be done late in pregnancy when the fetus is beyond the period of organogenesis, and when a comparison can be made of the fetal head size to pelvic size."

### Groundless Fears

The need for physicians to relieve the public of groundless fears about radiation was

stressed by Dr. Edith H. Quimby of New York City, who suggested that radiologists have a special competence to explain the subject to medical groups, hospital administrators, and civic organizations.

She urged physicians to bear in mind that the dose to the individual is less important than the average dose to the entire population in the period between conception and the end of childbearing.

She added that radiation received by elderly persons is of no consequence whatsoever to the genetic problem and, further, that it may be important for future generations that some individuals have their troubles correctly diagnosed and treated effectively by radiation.

## Radiation Dose Glossary

**background** Ever-present effects in physical apparatus above which a phenomenon must manifest itself in order to be measured. "Background" can take various forms, depending on the nature of the measurement. In electrical measurements of radioactivity and nuclear phenomena, the term usually refers to those undesired counts or currents that arise from cosmic rays, local contaminating radioactivity, insulator leakage, amplifier noise, power-line fluctuations, and so on. In nuclear work and photographic emulsions, the term refers to developable grains unrelated to the tracks under investigation.

**curie, c** 1. The present definition of the curie is: The unit of radioactivity defined as the quantity of any radioactive nuclide in which the number of disintegrations per second is $3.70 \times 10^{10}$.

2. An earlier definition of the curie was: The quantity (grams) of radon in equilibrium with 1 gram of radium.

**dose** (or **dosage**) (radiobiology) According to current usage, the radiation delivered to a specified area or volume or to the whole body. Units for dose specification are roentgens for X- or gamma rays, reps or equivalent roentgens for beta rays. The subject of dose units for particulate radiation and for very high energy X-rays has not been settled. In radiology the dose may be specified in air, on the skin, or at some depth beneath the surface; no statement of dose is complete without specification of location. The entire question of radiation dosage units is under consideration by the International Congress of Radiology, and it is expected that new units based on the energy absorbed in tissue will be adopted.

**dose, air** (X-rays) (radiobiology) X-ray dose expressed in roentgens delivered to a point in free air. In radiologic practice it consists only of the radiation of the primary beam, and that scattered from surrounding air.

**dose, cumulative** The total dose resulting from repeated exposures to radiation of the same region, or of the whole body.

**dose, depth** The radiation dose delivered at a particular depth beneath the surface of the body. It is usually expressed as percentage of surface dose or as percentage of air dose.

**dose, exit** Dose of radiation at surface of body opposite to that on which the beam is incident.

**dose, integral** (or **volume dose**) A measure of the total energy absorbed by a patient or any object during exposure to radiation. According to British usage the integral dose for X- or gamma rays is expressed in gramroentgens.

**dose, median lethal (MLD)** Dose of radiation required to kill, within a specified period, 50 percent of the individuals in a large group of animals or organisms.

**dose, percentage depth** Amount of radiation delivered at a specified depth in tissue, expressed as a percentage of the amount delivered at the skin, or as percentage of air dose.

**dose, permissible** (Supersedes the term tolerance dose. For detailed information, see National Bureau of Standards Handbook 59 and subsequent publications.)

**dose, skin** Dose at center of irradiation field on skin. It is the sum of the air dose and back scatter, with the addition of the exit dose from other parts, if this is significant.

**dose, threshold** The minimum dose that will produce a detectable degree of any given effect.

**dose, tissue** Dose received by a tissue in the region of interest. In the case of X-rays and gamma rays, tissue doses are expressed in roentgens. At the present time there is no generally accepted unit of tissue dose for other ionizing radiations. In radiobiological studies it is customary to think of the tissue dose in terms of the energy absorbed per gram of tissue. Several units related to the roentgen have been suggested, such as the rep (*see roentgen equivalent, physical*) and *rad*.

**dose, tolerance** A term based on the assumption that an individual can receive such a dose of radiation without any harmful effects. It is now superseded by permissible dose.

**dose-effect curve** A curve relating to the dose of radiation with the effect produced.

**dose fractionation** A method of administration of radiation in which relatively small doses are given daily or at longer intervals.

**dose meter, dosimeter** Any instrument which measures radiation dose.

**dose meter, integrating** Ionization chamber and measuring system de-

signed for determining total radiation administered during an exposure. In medical radiology the chamber is usually designed to be placed on the patient's skin. A device may be included to terminate the exposure when it has reached a desired value.

**dose protraction** A method of administration of radiation by delivering it continuously over a relatively long period at a low dosage rate.

**dose rate, dosage rate** Radiation dose delivered per unit time.

**dose rate meter** Any instrument which measures radiation dose rate.

**exposure** Condition of being in the path of radiations (*see dose*).

**exposure, acute** (radiobiology) Radiation exposure of short duration.

**exposure, chronic** (radiobiology) Radiation exposure of long duration, by fractionation or protraction.

**milliroentgen** One-thousandth of a roentgen.

**rad** One hundred ergs of absorbed energy per gram of absorbing material.

**roentgen, r** The quantity of X- or gamma radiation such that the associated corpuscular emission per 0.001293 grams of air produces, in air, ions carrying 1 esu of electricity of either sign. Associated corpuscular emission is the full complement of secondary charged particles (usually limited to electrons) associated with an X-ray or gamma ray beam in its passage through matter.

**roentgen equivalent, man (rem)** The dose of any ionizing radiation that will produce the same biological effect as that produced by 1 roentgen of high voltage X-radiation. (A proposed unit, Parker.)

**roentgen equivalent, physical (rep)** A unit proposed to apply to statements of dose of ionizing radiation not covered by the definition of the roentgen. It has been variously defined as the dose which produces energy absorption of 83 ergs per gram of tissue or 93 ergs per gram of tissue. The actual energy absorption in tissue per roentgen is a function of the tissue composition and of the wavelength of the radiation, and ranges between 60 and 100 ergs per gram.

SOURCE: *A Glossary of Terms in Nuclear Science and Technology (ASA N1.1-1957 UDC 001.4:539) of National Research Council Conference. Published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.*

## Course in Public Health Problems of Radiation

A course in public health aspects of radiation will be conducted by the Radiological Health Medical Program, Public Health Service, January 13–24, and repeated May 13–24, 1958, in Washington, D. C. The course is designed for medical, dental, and biological personnel of Federal, State, and local health agencies, who are concerned with radiological health but who are without formal training in this field.

With the objective of preparing trainees for program planning, the course will cover:

- The various applications of nuclear energy and radiation, stressing their public health implications.
- The biological effects of radiation, particularly long-term effects, such as carcinogenesis, mutation, and lifespan shortening.
- The philosophy and procedures related to radiation protection and practical methods of reducing exposure from medical and dental X-rays to patient as well as to operators.
- Potential administrative problems in setting up radiological health programs, and the status of related legislative and regulatory procedures.

Applications and further information may be obtained from the Chief, Radiological Health Medical Program, Division of Special Health Services, Public Health Service, Washington 25, D. C.

*An assay of thyroids from livestock indicates that radioactive iodine is accumulated and readily detectable in these glands following nuclear weapons testing. The levels found are an index of fission product contamination in the area.*

# Radioactivity in Animal Thyroid Glands

ARTHUR H. WOLFF, D.V.M.

A STUDY of radioactivity in animal thyroid glands was conducted to determine the feasibility of this technique in monitoring the environment for radioactive fallout. Thyroid glands of 412 animals from four States were assayed for evidence of fresh fission products from nuclear weapons testing which the United States began in the Pacific, May 5, 1956.

There are several radioisotopes of iodine which contribute significantly to the mixture of early gross fission products (*1*). Of these iodine–131 has the longest half-life—about 8 days—and it is the iodine isotope of most concern biologically. Radioactive isotopes of iodine assimilated by animal or man behave biologically just like the naturally occurring stable isotope of iodine and concentrate in the thyroid gland. If animals eat a gross mixture of fission products less than several weeks old, a significant portion of the $I^{131}$ present would be concentrated in a small volume of thyroid tissue and would be readily detectable with appropriate instruments.

Thyroid concentration of fission-produced radioiodine may be associated not only with fallout from nuclear weapons tests but also with fission product waste from nuclear reactors. Hanson and Browning have found $I^{131}$ in the thyroids of indigenous jackrabbits associated with stack discharge of radioactive wastes at the Hanford Atomic Products Operation (*2*). They have collected data since 1951, trying to derive ratios between concentrations of $I^{131}$ in rabbit thyroids and the waste emission rate from the Hanford plant.

In 1953, I assayed thyroids from 10 sheep originating in 6 herds near Cedar City, Utah, and found concentrations averaging about 0.6 microcurie $I^{131}$ per gram of thyroid tissue at the time of autopsy. There was evidence that these sheep had assimilated fission products falling out from a Nevada "shot" 2 or 3 weeks prior to the autopsy (*3*).

Since that time, other investigators have reported radioactive iodine in animal thyroids (*4–7*). The activity presumably was associated with nuclear weapons testing in all instances.

## Methods

Single or partial lobes of thyroid glands from animals obtained between April 14 and October 18, 1956, were received in 10 percent formalin solution from Arizona, Ohio, Oregon, and Pennsylvania.

The specimens were individually prepared for beta counting. Each lobe or partial lobe initially was blotted, and, generally, a 1-gram portion from each specimen was placed in an individual flask to which a few drops of sodium iodide solution (20 mg. of iodide per ml.) and 5 ml. of 0.5 normal sodium hydroxide were

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added. The flasks were gently heated, usually 1 to 2 hours, until digestion was complete. Each digest was transferred to a stainless steel planchet cup (2″ by 3/16″) and thoroughly dried by infrared heating. The radioactivity of the residue in the cups then was counted in an alpha, beta, gamma, proportional counter (NMC Model PC–1). Activity, after the required corrections, was expressed as millimicrocuries (mμc.) per gram of wet (formalized) tissue, extrapolated to the date of slaughter or death of the animal. Preliminary studies indicated that the weight of thyroids after soaking in 10 percent formalin for several days was about 10 percent greater than fresh weight. The more active samples were checked periodically for decay, substantiating a half-life of about 8 days.

Specimens with an activity greater than 0.05 mμc./gm. were counted with a standard deviation of less than 10 percent. Those having activity of less than 0.05 mμc./gm. were counted with a standard deviation ranging from 10 to 50 percent. The lower limit of detection was 0.01 mμc./gm. ±50 percent.

### Results and Discussion

Of the specimens received, 81 were from small animals, mostly dogs and cats undergoing postmortem examination in veterinary clinics in Ohio and Pennsylvania, and 331 were from livestock, mostly cattle and sheep. Pennsylvania livestock specimens came from the diagnostic laboratory, New Bolton Center, University of Pennsylvania Veterinary School. All other livestock thyroids came from slaughterhouses in Phoenix, Ariz., Columbus and Cincinnati, Ohio, and Portland, Oreg.

All thyroids from animals dying between April 14 and May 16, 1956, were considered pre-series specimens, thus arbitrarily allowing 11 days after the announced start of the United States Pacific test series for the occurrence of fallout in the United States and the assimilation of $I^{131}$ by animals.

No $I^{131}$ was detected in 33 pre-series thyroids from small animals. From the thyroids of 45 small animals dying between May 16 and the end of July, $I^{131}$ was detected in only one thyroid: there was 0.04 mμc./gm. in a specimen from a cat in Pennsylvania.

It is thought that any activity found in small animal thyroids would be mainly attributable to inhalation and, to a minor extent, dietary intake, depending on the quantity of fresh milk consumed. Milk, as a possible vehicle for $I^{131}$, is discussed later in this report. The sensitivity of the equipment available for this study probably was too limited (0.01±50 percent mμc./gm.) to detect the low levels of activity expected in small animals in contrast with the expected concentrations assimilated by grazing animals. Livestock may graze daily many hundreds of square feet of pasture which serves as an efficient collector of fallout. On the basis of a report by Chamberlain (*8*) it is estimated that in an area with a given sustained atmospheric concentration of $I^{131}$, the thyroid $I^{131}$ uptake by cattle as a result of grazing in the area would be several thousand times greater than what could be attributed to inhalation alone.

As anticipated, the thyroids from livestock revealed much more activity than those from nongrazing small animals. The total number of livestock specimens assayed during select sampling periods and the corresponding number in which activity was detected are summarized below.

| *Period* | *Number of livestock specimens* | *Number with detectable $I^{131}$ activity* |
|---|---|---|
| Pre-series | 60 | 2 |
| May 16–June 15 | 70 | 27 |
| June 16–July 30 | 89 | 65 |
| August 1–August 31 | 102 | 92 |
| September 1–October 18 | 10 | 10 |

A progressive increase in the proportion of livestock thyroids with detectable activity is apparent following the onset of the United States tests in the Pacific. In view of the announced July 23 terminal date of these tests and the announcement of a Russian test series beginning on August 24, the activity in the last 10 specimens is thought to be associated with the Russian series.

Table 1 summarizes the numbers of thyroid specimens tested and the mean concentrations of $I^{131}$ detected, according to the species, geographic origin, and period of collection. Table 2 summarizes the distribution of the individual samples with respect to the levels of activity according to period and species.

The indicated levels of activity for the Ore-

gon specimens undoubtedly are lower than the actual values, since we were not able to determine the date of slaughter for most of the samples submitted from this State. The Oregon activity, therefore, was extrapolated to the date of mailing in instances of unspecified slaughter dates. Some of the specimens were shipped as much as 2 to 3 weeks following the date of collection.

Van Middlesworth has reported that sheep tend to concentrate greater amounts of $I^{131}$ in the thyroid than do cattle (*4*). The limited data presented here tend to substantiate this observation when the mean levels of activity of the two species are compared during the same period and within the same State. The data for Oregon sheep and cattle during the last period would indicate the opposite. However, the quantitative significance of these data is questionable because, as previously pointed out, the slaughter dates and the proper extrapolation factors for these specimens are not known.

For the most part the specimens from Pennsylvania showed less activity than those from the other States. The livestock thyroids from this State originated in a veterinary diagnostic laboratory, and most of the source animals were moribund or dead when received by the laboratory, in contrast with the presumably healthy grazing animals serving as a source of thyroids in the other States. This is offered as a possible reason for the difference in activity.

Although $I^{131}$ was readily detectable in thyroids of animals from widely varied locations after May 16, the estimated doses in the thyroid were quite low. The mean concentration of $I^{131}$ in cattle thyroids in Ohio and Arizona, based on the combined data of these two States, from May 16 through October 18 was about 0.5 mμc./gm. The mean concentration for sheep in these same States was about 1.7 mμc./gm. If we assume that these mean values represent the average daily sustained concentrations of $I^{131}$, we can estimate the total integrated dose during the 150-day period of this study to be about 910 millirep (milliroentgens equivalent physical) and 3,100 millirep for cattle and sheep respectively. Stated in another manner, the average weekly thyroid dose would have been about 42 millirep per week and 144

**Table 1. Average concentration of iodine-131 from 331 livestock thyroid glands, April 24 through October 18, 1956**

| Period and State | Cattle | | Sheep | | Other animal | |
|---|---|---|---|---|---|---|
| | Number of specimens | Mean activity [1] | Number of specimens | Mean activity [1] | Number of specimens | Mean activity [1] |
| *Apr. 24–May 15 (pre-series)* | | | | | | |
| Arizona | 21 | [2] | 15 | [2] | 0 | |
| Ohio | 12 | 0.0041 | 0 | | 0 | |
| Oregon | 0 | | 0 | | 0 | |
| Pennsylvania | 7 | [2] | 1 | [2] | 4 | [2] |
| Total | 40 | .0008 | 16 | [2] | 4 | [2] |
| *May 16–Aug. 15* | | | | | | |
| Arizona | 36 | .25 | 9 | 2.70 | 0 | |
| Ohio | 46 | .58 | 34 | 1.37 | 9 | 0.46 |
| Oregon | 24 | .11 | 19 | .33 | 0 | |
| Pennsylvania | 8 | .14 | 5 | .20 | 16 | .067 |
| Total | 114 | .34 | 67 | 1.17 | 25 | .21 |
| *Aug. 16–Oct. 18* | | | | | | |
| Arizona | 12 | .28 | 3 | 2.15 | 0 | |
| Ohio | 14 | .80 | 0 | | 0 | |
| Oregon | 18 | .30 | 18 | .12 | 0 | |
| Pennsylvania | 0 | | 0 | | 0 | |
| Total | 44 | .45 | 21 | .41 | 0 | |

[1] Activity is in millimicrocuries per gram of thyroid extrapolated to date of slaughter.
[2] Background or activity below limit of sensitivity (0.01 mμc./gm.).

**Table 2. Distribution of iodine-131 concentration in livestock thyroids from Arizona, Ohio, Oregon, and Pennsylvania, April 24 through October 18, 1956**

| Period and species | Mean activity (mμc./gm.) | Highest activity (mμc./gm.) | Number of thyroid specimens | | | | |
|---|---|---|---|---|---|---|---|
| | | | Background | 0.01–0.1 mμc./gm. | 0.1–1.0 mμc./gm. | 1.0–10 mμc./gm. | Total |
| *Apr. 24–May 15 (pre-series)* | | | | | | | |
| Cattle | 0.0008 | 0.03 | 38 | 2 | 0 | 0 | 40 |
| Sheep | [1] | [1] | 16 | 0 | 0 | 0 | 16 |
| Other | [1] | [1] | 4 | 0 | 0 | 0 | 4 |
| Total | | | 58 | 2 | 0 | 0 | 60 |
| *May 16–Aug. 16* | | | | | | | |
| Cattle | .34 | 2.5 | 53 | 19 | 27 | 15 | 114 |
| Sheep | 1.17 | 5.3 | 12 | 1 | 34 | 20 | 67 |
| Other | .21 | .87 | 6 | 6 | 13 | 0 | 25 |
| Total | | | 71 | 26 | 74 | 35 | 206 |
| *Aug. 16–Oct. 18* [2] | | | | | | | |
| Cattle | .45 | 4.20 | 6 | 11 | 20 | 7 | 44 |
| Sheep | .41 | 2.50 | 1 | 6 | 11 | 3 | 21 |
| Total | | | 7 | 17 | 31 | 10 | 65 |

[1] Background or activity below limit of sensitivity (0.01 mμc./gm. ± 50 percent).
[2] Only cattle and sheep were assayed in this period.

millirep per week for cattle and sheep during the period of May 16 through October 18, 1956.

These values are in general agreement with the dosage levels reported in similar studies (*4–7*). These exposure levels are apparently harmless for livestock and probably would represent no acute hazard to animals even if exceeded by 1 or 2 orders of magnitude (*9*).

Van Middlesworth, since November 1954, has been conducting an extensive sampling program, testing 15 thyroids a week from cattle raised in the Memphis area (*4*). The mean weekly concentration of $I^{131}$ found in these cattle for a 70-week sampling period was about 0.9 mμc./gm. If we can assume that these data, along with the Ohio and Arizona data given here, are representative of the rest of the country, we can estimate that the average concentration of $I^{131}$ in cattle thyroids has been at least 0.5 mμc./gm., resulting in an average cattle thyroid dose of at least 42 millirep per week over the last 2 to 3 years.

Generally, it is accepted that body burden levels of radioisotopes found in grazing animals will be many times greater than those likely to be present among the adult human population in the same area. Comar found the $I^{131}$ content in animal thyroids to be 18 to 85 times that found in humans in the same locale (*7*). Van Middlesworth reported maximum $I^{131}$ activity in cattle to be 200 times the maximum activity in humans in the same area (*4*).

Thus, if cattle have been subjected to thyroid exposure levels in the order of 42 millirep per week, it appears that the general population has been subjected to considerably less. However, it should be pointed out that the thyroid dosage received by infants and young children may be considerably higher than that by adults because significant portions of $I^{131}$ ingested by dairy cows will be secreted with the milk (*10*, *11*).

According to data of Hunter and Ballou (*1*), limited evidence (*12–15*), and theoretical considerations (*16*), significant levels of various other fission product radioisotopes would be secreted into milk concomitantly with $I^{131}$. Although there has been extensive investigation (*17–18*) with respect to the levels of the long-life alkaline earth, strontium-90, in milk, human bones, and other biological material, to my knowledge there has been but limited investigation of the relative contribution of other fission products, particularly some of the shorter-lived radioelements, via the nutritional medium of milk.

The levels of animal thyroid activity in this study, though readily detectable, occurred for the most part in the absence of significant increases in gamma background and air activity as reported weekly by the Nationwide Radiation Surveillance Network (*19*). It is conceivable that for limited periods levels of fission product activity in milk could approach peacetime permissible levels with little or no perceptible increase in background levels (*16*).

## Summary

Iodine-131 activity was readily found in thyroid glands from grazing animals in Arizona, Pennsylvania, Ohio, and Oregon within 2 weeks following the start of the 1956 United States Pacific atomic weapons tests. A progressive increase was noted in the proportion of samples which were active from mid-May to mid-October, at which time the study was terminated.

Based on the Arizona and Ohio data, the average weekly dosages from mid-May to mid-October to cattle and sheep were 35 and 120 millirep respectively, apparently harmless to the health of animals. It is suggested that the average cattle $I^{131}$ level found in this study approximates the average continuously existing in United States cattle during the past 2 or 3 years.

Theoretical considerations indicate that with the levels of $I^{131}$ found in cattle thyroids, detectable amounts of $I^{131}$ would have been secreted with the fresh milk produced in these areas.

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## Radiation Protection in Industry

In interactions between advisory and official groups toward effecting the protection of workers against radiation hazards in industry, it is the employer who must provide the means for protection.

For the employer to have knowledge of the extent of potential radiation hazards, and for their proper evaluation, a chain of communication must be established between him and the manufacturer of a radiation source. The communication line, for other reasons, should extend to operators, to other employees, and perhaps to the public. Certainly the employees of an official agency having jurisdiction over protection practices must know that a hazard is present.

Registration of radiation sources is based upon the need to know where radiation hazards are present in industry. Connecticut, Delaware, New York (both health and labor departments), North Dakota, Pennsylvania, South Dakota, Texas, and Wisconsin require registration of radiation sources. The very act of registering a source provides a stimulus for conscious recognition of radiation hazards and their control by the employer.

We cannot, however, register all radioactive materials; our own bodies contain some amounts. And there is general acceptance that certain radiation sources containing measureable amounts of radioactive materials (such as radium dial wrist watches) may be allowed in general commerce without tight regulations. Large numbers of such items, on the other hand, in collecting points may bring into one spot enough radioactive materials to produce a hazard.

These quantities must be labeled. The pictured radiation hazard warning symbol—a purple, three-bladed "propeller" on a yellow background—has been adopted by the Atomic Energy Commission and several States.

Attempts are being made to standardize radiation protection in manufactured items and operations in industry. Standard shielding, installation, and maintenance will be the same for the strontium-90 thickness gauge wherever it may be located. Standards are being developed to apply to dental X-ray units, radioisotopic radiographs, and radium static electricity eliminators. The American Standards Association is developing standards aimed at the manufacture of sealed beta ray sources, and perhaps even "mass-produced" nuclear reactors, so that the hazard picture associated with any one unit can be repetitively characterized.

—*Excerpts from an address presented by Saul J. Harris, assistant manager of technical services, Atomic Industrial Forum, Inc., at the Sixth Annual Health Conference of the Pennsylvania Department of Health, Aug. 21, 1957.*

# *Characteristics and Professional Staff of Outpatient Psychiatric Clinics*

OUTPATIENT psychiatric clinics today provide an important segment of the total psychiatric services in communities throughout the country. Nationwide data on these facilities and the patients they serve are reported annually to the National Institute of Mental Health, Public Health Service, through a program initiated in 1954 with the cooperation of State mental health authorities and professional groups. Data on characteristics of clinics and their professional staff are summarized in Public Health Monograph No. 49.

Outpatient psychiatric clinics are defined as facilities "where a psychiatrist is in attendance at regularly scheduled hours and takes the medical responsibility for all of the patients in the clinic."

In 1954–55, these clinics, operating under a variety of governmental and nongovernmental auspices to provide services to children and adults seeking or referred for psychiatric services, numbered 1,234. Approximately half of all outpatient psychiatric clinics were full time (open 35 hours or more a week). Part-time clinics included a number of clinic teams traveling under State governmental auspices to provide a minimum of regularly scheduled service in less populated areas where there were no other psychiatric services.

Although clinics were located in all but one State, there was considerable geographic disparity in the number of clinic professional man-hours of service per 100,000 population. States in the Northeast tended to have relatively high ratios of professional man-hours to population; States in the South, low ratios. There were relatively few clinic facilities in semirural and rural areas compared with the number of clinic facilities in large cities. An important factor in the geographic imbalance of clinic services was the concentration in urban areas of medical and other professional training facilities.

Two-fifths of the total clinic professional man-hours of service reported were provided

Public Health

MONOGRAPH

## No. 49

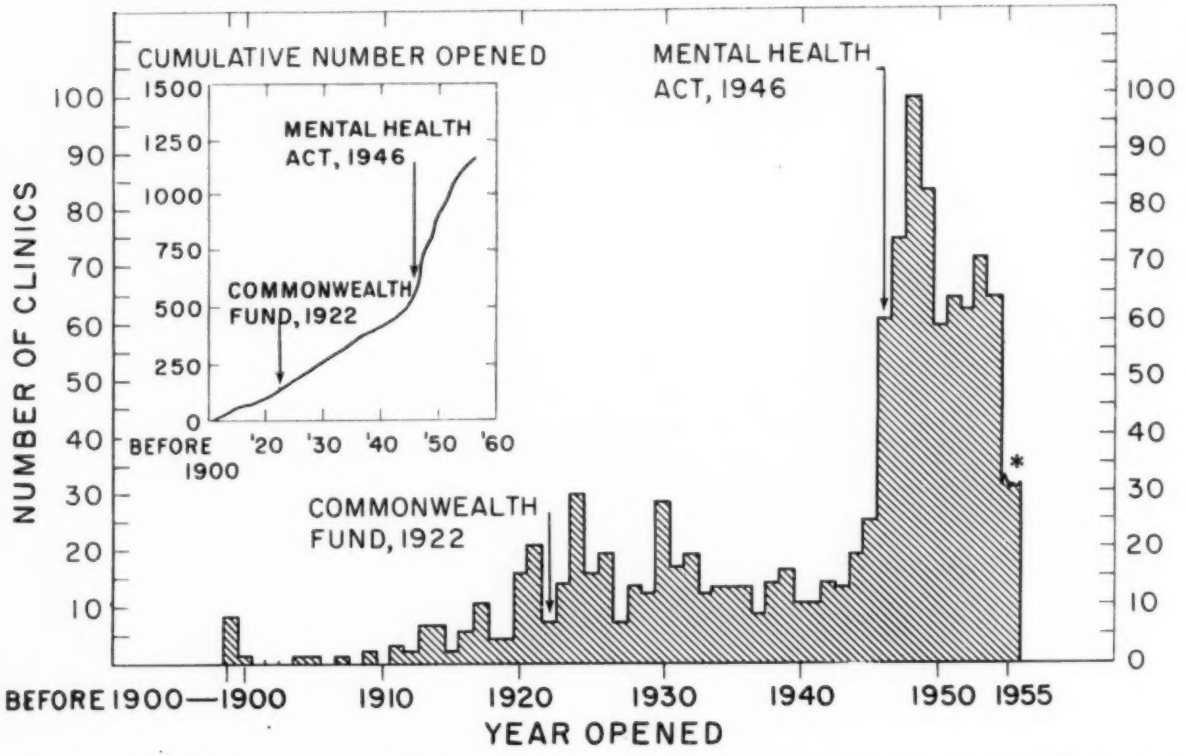
The accompanying summary covers the principal findings presented in Public Health Monograph No. 49, published concurrently with this issue of Public Health Reports. The authors are with the Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

• • •

Bahn, Anita K., and Norman, Vivian B.: Characteristics and professional staff of outpatient psychiatric clinics. Public Health Monograph No. 49 (PHS Publication No. 538). 87 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1957. Price 50 cents.

**Number of outpatient psychiatric clinics, by year opened, United States, 1954–55.**




SOURCE: Data based on reports from 1,140 of the 1,234 outpatient psychiatric clinics in the United States, 1954–55.

*Incomplete data.

by 688 clinics serving both children and adults; two-fifths by 381 clinics offering diagnostic and treatment services for children only, usually including some collateral service with their parents; and one-fifth in 136 clinics serving adults exclusively. In about a fourth of all mental health clinics, service was limited either to selected diagnostic groups of persons, such as discharged mental hospital patients, alcoholics, mentally retarded persons, epileptics, and juvenile delinquents, or to other special eligible groups—veterans, students, or court cases.

A total of 9,500 professional staff were employed in outpatient psychiatric clinics throughout the country; 90 percent were psychiatrists, clinical psychologists, and psychiatric social workers—members of professions which traditionally provide the skills coordinated in the outpatient psychiatric clinic. Seventy percent of all clinics had personnel from each of these three disciplines. A small number of pediatricians, internists, nurses, and occupational and remedial therapists were employed in specialized clinics. Of the 9,500 professional staff, less than one-third were regular full-time employees, half were part-time employees, and one-fifth were trainees. Due to the high proportion of part-time psychiatrists and other professionals, the 9,500 professional employees represented the equivalent services of less than 5,400 full-time persons.

The professional staff provided an average of 115 man-hours of clinic service per week for each 100,000 population. If it is assumed that a full-time clinic is staffed by a team comprised of a psychiatrist, a clinical psychologist, a psychiatric social worker, and either an additional psychiatric social worker or other professional person, providing a total of 140 man-hours of service per week, only 9 States (District of Columbia, New York, Massachusetts, Kansas, Connecticut, Illinois, Delaware, Rhode Island, and Hawaii) met a hypothetical minimum re-

quirement of one full-time clinic per 100,000 population. Only the District of Columbia, New York, and Massachusetts, all psychiatric training centers, provided the equivalent of two full-time clinics per 100,000 population. Even in these States, long waiting lists for clinic service reflect the unmet needs related to a dense metropolitan population, services to nonresidents, and considerable training activities.

On the basis of projected civilian population growth, the number of outpatient psychiatric clinic staff will have to be increased 50 percent to meet a minimum requirement of one full-time clinic (140 man-hours of service) per 100,000 population by 1965, or tripled if two full-time clinics per 100,000 population is established as a minimum goal.

Areas requiring additional research and planning include—

- Ways of increasing the total supply of professional personnel trained in accredited schools and, at the same time, effecting a more balanced geographic distribution of professional resources.
- Morbidity studies to determine the total number of mentally ill persons in the country and in various communities, by age, sex, and psychiatric disorder.
- Development of guides for determining the need for and ways of providing more adequate clinic service in sparsely populated and highly urban areas.
- Development of "ideal" patterns of mental health service in communities as guides, including clarification of the role of the various psychiatric agencies and of other mental health facilities, such as family service agencies, counseling centers, schools, local health departments, and general practitioners.
- Reexamination of the responsibilities of each professional staff member toward child and adult patients in light of the advances being made in professional education and training and in psychodynamics, the possible changes that may occur as a result of the widespread use of tranquilizing drugs, and the general shortage of professional personnel.

## Reginald M. Atwater, 1892–1957

Dr. Reginald M. Atwater, executive secretary of the American Public Health Association, died October 18, 1957. At the time of his death, Dr. Atwater was also managing editor of the *American Journal of Public Health*, as well as special consultant to the Public Health Service and a board member of the National Health Council. Before becoming executive secretary of the association in 1935, he was commissioner of health of Cattaraugus County in New York for 8 years.

Under the auspices of the Yale in China organization, Dr. Atwater served as associate professor of preventive medicine and public health in the Hunan Yale College of Medicine, Chungsha, China, from 1921 to 1925. On his return to the United States, he joined the faculty of Harvard Medical School and the School of Public Health, where he taught preventive medicine and epidemiology and conducted research on pneumonia and rheumatic fever.

A graduate of Harvard Medical School, Dr. Atwater was a Rockefeller Foundation fellow in public health and in 1920 and 1921 took the degrees of master and doctor of public health at Johns Hopkins University School of Hygiene and Public Health.

In 1939, Dr. Atwater received the Order of Carlos J. Finlay from the Cuban Government. Ten years later he was awarded an honorary degree by Colorado College. He also received the Sedgwick Memorial Medal of the American Public Health Association and was made an honorary fellow of the Society of Medical Officers of Health in Great Britain in 1952. In 1957, he became an honorary associate fellow of the American Academy of Pediatrics.

See Table ▶

# Sanitary Engineering Graduate Degrees Awarded in 1956

FREDERICK K. ERICKSON, S.M.,
and FRANK A. BUTRICO, M.S.S.E.

IN the academic year 1955–56, 133 graduate degrees were conferred in the United States in the field of sanitary engineering, 12 fewer than in 1954–55. Of this total, 124 were master's and 9 doctor's degrees, granted in August 1955, February 1956, and June 1956. A total of 208 completed undergraduate sanitary engineering courses.

Institutions conferring sanitary engineering degrees are listed in the accompanying table with the number of degrees conferred. A list of all schools offering such training is available from the authors. Similar data for the period since 1889 are available in the literature (*1–3*) or have been distributed by the Public Health Service.

### Undergraduate Degrees

Undergraduate sanitary engineering training was offered by 53 institutions. Of these, 32 reported graduates who had received "undergraduate training toward the bachelor's degree in sanitary engineering or with sanitary engineering major or option." For the academic years 1952–53, 1953–54, and 1954–55, the number of undergraduate degrees were 216, 164, and 141, respectively. The bulk of the increase during 1955–56 over the previous academic year is represented by two schools reporting a total of 63 graduates this year but which reported none in the 1954–55 survey. The average number of graduates per year for the previous 10-year period 1946–55 was 181 and for the 5-year period 1951–55, it was 196.

*Mr. Erickson is sanitary engineer director, and Mr. Butrico is chief, Office of Engineering Resources, Division of Sanitary Engineering Services, Public Health Service.*

### Master's Degrees

Of the 124 master's degrees awarded in the 1955–56 academic year, 93 were awarded to citizens of the United States, a decrease of 7 percent from the number in 1954–55. Graduate sanitary engineering training at the master's level was available in 67 universities or colleges, of which 34 reported no such degrees awarded this year. For the academic years 1952–53, 1953–54, and 1954–55, the numbers of master's degrees awarded were 102 (20 to foreign nationals), 120 (25 to foreign nationals), and 134 (34 to foreign nationals). The average number of master's degrees conferred per year for the 10-year period 1946–55 was 126, and for the 5-year period 1951–55, 122.

### Doctor's Degrees

Seven institutions awarded a total of 9 doctor's degrees, all but one to citizens of the United States. Doctoral training was available at 20 other institutions which reported no award of doctoral degrees. For the academic years 1952–53, 1953–54, and 1954–55, the numbers of graduates receiving doctor's degrees were 5 (3 foreign nationals), 9 (no foreign nationals), and 11 (2 foreign nationals), respectively. In the 10-year period 1946–55 the average number of doctor's degrees conferred per year was 5.6, and for the 5-year period 1951–55, the average was 8.2.

### REFERENCES

(*1*) Miller, Arthur P.: Graduates from undergraduate sanitary engineering courses in the United States. Pub. Health Rep. 66: 369–374, Mar. 23, 1951.

(*2*) Laubusch, E. J., and Ludwig, H. F.: Sanitary engineering degrees awarded in 1955. Pub. Health Rep. 71: 945–946, September 1956.

(*3*) Miller, A. P.: Sanitary engineering degrees given in 1954. Pub. Health Rep. 70: 1039–1040, October 1955.

**Engineering degrees awarded in 1956 to persons with sanitary engineering training, United States**

| Institution | Doctor's | Master's | Bachelor's |
|---|---|---|---|
| Alabama Polytechnic Institute | ------ | 0 | 2 |
| Alabama, University of | ------ | 0 | 0 |
| Arizona, University of | ------ | ------ | 0 |
| Arkansas, University of | ------ | 1 | ------ |
| California Institute of Technology | 0 | [1] 3 | ------ |
| California, University of | 2 | [1] 10 | 5 |
| California, University of Southern | ------ | ------ | 0 |
| Case Institute of Technology | ------ | 0 | ------ |
| Cincinnati, University of | ------ | 0 | ------ |
| Clemson Agricultural College | ------ | ------ | 6 |
| College of Agricultural and Mechanical Arts, Puerto Rico | ------ | ------ | 0 |
| Colorado, University of | ------ | 1 | 4 |
| Connecticut, University of | ------ | 0 | ------ |
| Cornell University | 1 | 0 | 0 |
| Florida, University of | 0 | 2 | 2 |
| George Washington University | ------ | ------ | 0 |
| Georgia Institute of Technology | ------ | 0 | [1] 10 |
| Harvard University | 1 | [1] 11 | 0 |
| Idaho, University of | ------ | 0 | ------ |
| Illinois Institute of Technology | 0 | 0 | ------ |
| Illinois, University of | ------ | [1] 4 | 2 |
| Iowa State College | 0 | 2 | 2 |
| Iowa, State University of | ------ | [1] 3 | 2 |
| Johns Hopkins University | [1] 1 | [1] 5 | ------ |
| Kansas State College | ------ | ------ | 29 |
| Kansas, University of | ------ | 0 | 2 |
| Kentucky, University of | ------ | 0 | ------ |
| Lehigh University | ------ | ------ | 0 |
| Maine, University of | ------ | 0 | 2 |
| Manhattan College | ------ | ------ | 16 |
| Marquette University | ------ | ------ | 0 |
| Massachusetts Institute of Technology | 2 | [1] 15 | 3 |
| Massachusetts, University of | ------ | 0 | 0 |
| Michigan State College | 0 | 1 | ------ |
| Michigan College of Mining and Technology | ------ | 0 | 5 |
| Michigan, University of | 0 | 12 | 0 |
| Minnesota, University of | 0 | [1] 2 | 0 |
| Mississippi State College | ------ | 0 | 12 |
| Missouri School of Mines and Metallurgy | ------ | 0 | 4 |
| Missouri, University of | ------ | 0 | 5 |
| Nebraska, University of | ------ | 0 | ------ |
| New Hampshire, University of | ------ | 0 | ------ |
| Newark College of Engineering | ------ | 3 | 5 |
| New Mexico College of Agricultural and Mechanical Arts | ------ | 0 | 0 |
| New York University | 1 | [1] 11 | 12 |
| North Carolina State College | ------ | 2 | ------ |
| North Carolina, University of | ------ | [1] 6 | ------ |
| North Dakota, University of | ------ | 0 | 0 |
| Northeastern University | ------ | 2 | ------ |
| Northwestern Technological Institute | 0 | [1] 3 | ------ |
| Ohio State University | 0 | 0 | 0 |
| Oklahoma Agricultural and Mechanical College | 0 | [1] 1 | 2 |
| Oklahoma, University of | ------ | [1] 4 | 0 |
| Oregon State College | 0 | 1 | ------ |
| Pennsylvania State University | 0 | [1] 2 | 12 |
| Polytechnic Institute of Brooklyn | ------ | 0 | 0 |
| Purdue University | 0 | [1] 2 | 5 |
| Rensselaer Polytechnic Institute | ------ | 0 | 8 |
| Rhode Island, University of | ------ | 0 | ------ |
| Rutgers University | ------ | 2 | 3 |
| South Dakota State College | ------ | 0 | 1 |
| Southern California, University of | ------ | 1 | ------ |
| Southern Methodist University | ------ | [1] 1 | ------ |
| Stanford University | ------ | ------ | 0 |
| Tennessee, University of | ------ | 0 | ------ |
| Texas, Agricultural and Mechanical College of | 0 | 0 | ------ |
| Texas Technological College | ------ | 0 | 2 |
| Texas, University of | 0 | 2 | 0 |
| Tulane University of Louisiana | ------ | 0 | 0 |
| Utah, University of | ------ | 0 | ------ |
| Virginia Polytechnic Institute | 0 | 5 | 34 |
| Washington, State College of | ------ | [1] 2 | 2 |
| Washington University | ------ | 0 | ------ |
| Washington, University of | 0 | 1 | 0 |
| West Virginia University | ------ | 0 | 1 |
| Wisconsin, University of | 1 | 1 | 8 |
| Wyoming, University of | ------ | 0 | ------ |
| Total | 9 | 124 | 208 |

[1] Includes foreign nationals.
Leaders (------) indicate no courses offered at this level.

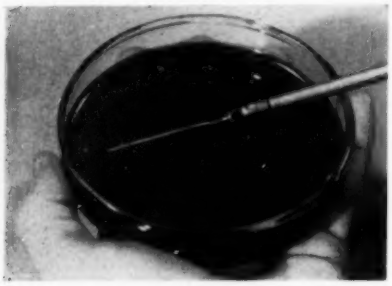
# PHS Films

## Isolation and Identification of Beta-Hemolytic Streptococci

**35-mm. filmstrip, color, sound, 11 minutes, 94 frames. 1957.**

**Audience: Bacteriologists, laboratory technicians, and medical students.**

This film is designed to show the techniques and procedures of isolating and identifying beta-hemolytic streptococci. It covers the preparation of blood agar pour-plates; procedures for isolating samples from swabs; identification of the organisms; and procedures for isolating samples from Loeffler slants. It ends with a brief recapitulation.



**Streaking blood agar pour-plate with beta-hemolytic streptococci**

## The Sanitary Landfill

### I. Operating Procedures
### II. Small Community Landfills

**35-mm. filmstrips, color, sound, 7 minutes, 59 frames, and 6 minutes, 41 frames respectively, 1957 and 1956.**

**Audience: Sanitarians, municipal officials, landfill equipment operators, and students of sanitary engineering.**

Basic principles which apply to all landfills are stressed throughout part 1. Variations according to location—level sites, deep valleys, rolling terrain, marshy areas—and other determinants are demonstrated and accessory practices and equipment described.

**Compacting refuse in well-operated landfill.**

**A sanitary landfill in operation in a small community**

The second part shows how the sanitary landfill can be adapted to small towns and communities. It features lightweight equipment in the several alternative practices presented.

## Rabies Control in the Community

**16-mm. filmstrip, black and white, sound, 11 minutes, 405 feet, 1956.**

**Audience: Veterinarians, both public health and practicing.**

Primarily motivational, this film is not designed for technical training, for use in medical schools, or for TV. Instead it identifies rabies as a public health problem and outlines a three-point program for control on a community basis. The film shows actual cases of rabies in man and dog, how apathy of dog owners permits rabies to become a community problem, and concerted action to prevent rabies.

## Coccidioidomycosis—Its Epidemiological and Clinical Aspects

**16-mm. film, color, sound, 19½ minutes, 701 feet. 1957.**

**Audience: Professional medical personnel and mycological laboratory directors.**

This film shows the distribution and ecology of the etiological agent, *Coccidioides immitis;* clinical aspects of the benign and disseminated forms through X-ray films, actual cases and animation; variations in the symptomatology; histology; serology; and laboratory procedures for isolation and identification of the fungus.

**Chain of arthrospores typical of C. immitis.**

*These films may be obtained on LOAN from the Communicable Disease Center, Public Health Service, 50 7th Street NE., Atlanta 5, Ga., or by PURCHASE from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.*

# *United States-U.S.S.R. Exchange Missions*

EARLY in 1956, under the auspices of the Public Health Service, four Russian virologists visited several poliomyelitis research institutions in the United States. Immediately following their visit, a group of American scientists visited a number of medical institutes and organizations in the Soviet Union.

The Soviet delegation stated that poliomyelitis in the Soviet Union has not presented as much of a public health problem as it has in the United States. There have been several serious outbreaks in certain Soviet Republics, but the incidence rate, though increasing, is approximately one-tenth as high as it is in this country.

Soviet research on poliomyelitis is in the early stages of technical development, but it has nevertheless made important contributions, such as the possible discovery of a type 4 virus. With the establishment of the Poliomyelitis Research Institute, where modern methods and equipment are used and which has an adequate supply of susceptible cells for tissue culture work, it can be expected that Soviet workers will soon be able to do large-scale diagnostic work and competent fundamental research and to use these for the development of applied techniques.

Other timely subjects discussed during the visit of the poliomyelitis team were the early laboratory diagnosis of epidemic influenza, attenuated live virus vaccines against influenza, measles, and mumps, Soviet research work on viral hemorrhagic fevers, viral chorioencephalitis and other virus diseases and the development of vaccines against brucellosis and tularemia.

The Soviet delegation repeatedly stated their belief in the freedom of scientific thought and freedom of exchange of ideas as the cornerstones of international and national science. They felt sure that the situation in the Soviet Union today is such as to warrant mutual understanding and close relationships between the scientists of the Soviet Union and the United States.

It is hoped that the program of exchange of scientific information, which began with the visit of the four Russian virologists, will continue for the benefit of both countries. Cer-

Public Health
MONOGRAPH

No. 50

The accompanying article summarizes Public Health Monograph No. 50, published concurrently with this issue of Public Health Reports.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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United States-U.S.S.R. medical exchange missions, 1956. Public Health Monograph No. 50 (PHS Publication No. 536). 95 pages. U. S. Government Printing Office, Washington, D. C., 1955. Price 50 cents.

tainly their visit paved the way for the American exchange mission to the Soviet Union.

At the Twentieth Congress of the Communist Party of the Soviet Union, which took place during the visit of the American Mission on Microbiology and Epidemiology to the Soviet Union, reference was made to the detrimental features of overcentralization and secrecy. Encouragement was given to exchanges of opinion, development of research at universities and relaxation of secrecy measures.

At this Congress, also, it was stated that Russia has nearly 3,000 institutions of research and education, of which more than one-third are in Moscow and Leningrad, and that 60 percent of the scientists of the ministries and 85 percent of the members of academies are to be found in these two cities.

The mission found that science has a preferred status in Soviet society. Medical education is under the jurisdiction of the Ministry of Health. There are 78 medical schools; each Republic and each large city has at least one. About 65 percent of the physicians and medical students are women.

Every activity in science and related technology is grouped into institutes: educational, research, and production. The mission visited 18 institutes and 3 centers of medical training, inspecting laboratory processes and discussing problems of mutual interest, which included poliomyelitis, Russian vaccines (including one for dysentery), preparation of antitoxins and immune globulin, the virus theory of cancer, and other medical and laboratory developments.

The mission found that the Soviet research institutes which they visited all had basic equipment available. Other technical equipment, however, appeared to be in short supply, and they were told that rare chemicals were difficult to procure. The Soviet institutes were equipped to turn out any biological required.

Members of the American Medical Mission were convinced that scientists of the United States should not continue to ignore Soviet medicine and research.

## Public Health Adviser and Analyst Positions

Examinations for public health advisers and public health analysts, at basic entrance salaries of from $4,525 to $11,610, have been announced by the U. S. Civil Service Commission. These positions are located in the Public Health Service and the Children's Bureau of the Department of Health, Education, and Welfare.

Full information about these examinations may be obtained by writing to the Executive Secretary, Board of U. S. Civil Service Examiners, Public Health Service, Washington 25, D. C.

Public health advisers assist States, communities, and groups in the development of adequate health services, in the maintenance of a healthful environment, in the development of the Nation's hospital and related health facilities, in the administration of grants-in-aid, and in the improvement of public health administration.

The work performed by the public health analyst involves identifying current and future public health problems and contributing to evaluations of the effectiveness of public health programs and methods. Analysts may have responsibilities for making studies, for example, toward relieving shortages of health personnel, extending service to patients, and making surveys of health problems.

The experience required to fill these positions includes 3 years general and up to 3 years specialized, depending on grade. Four years of appropriate college study may be substituted for the general experience requirements. Graduate study in fields related to the work of a public health adviser or analyst may be substituted for 1 year of the specialized experience requirements.

# publications

## National Stay-in-School Campaign

**Handbook for communities**

*Office of Education, Department of Health, Education, and Welfare; Department of Labor. 1957. 24 pages. 15 cents.*

Directed to parents, teachers, students, and other interested persons as part of a nationwide campaign, this handbook contains factual information about the school dropout problem and offers specific suggestions for encouraging more high school and college students to stay in school.

The handbook tells why we need a stay-in-school campaign, how to conduct a community drive, and what various individuals can do. Also included are appeals directed to youth, facts illustrating the importance of education, slogans, quotations, and a timetable of activities.

A limited number of free copies are available from the Office of Education, U. S. Department of Health, Education, and Welfare, Washington 25, D. C., and the Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C.

## Film Reference Guide for Medicine and Allied Sciences

*PHS Publication No. 487. Revised June 1957. 147 pages. 60 cents.*

Revised extensively, this guide supersedes all previous issues. It is designed to provide members of the Interdepartmental Committee on Medical Training Aids, as well as film users outside ICMTA member agencies, with a ready reference to selected medical films and to where they can be obtained.

Publication numbers for other ICMTA members are: Air Force, AFP 160-15-1; Army DA Pamphlet 108-2; Navy, NAV MED P 5042, Rev. 6-57; Veterans Administration, VA Catalog 7.

Copies can be obtained from the Card Division, Library of Congress, Washington 25, D. C.

## References on Aging for Health Personnel

*PHS Publication (unnumbered) 1957. 19 pages; mimeographed.*

A 15-page annotated bibliography of periodicals includes such topics as living arrangements, physical health, mental health, institutional facilities and care. There is also a four-page selected list of books and pamphlets. It was prepared by nursing and nutrition consultants of the Chronic Disease Program.

## Milestones in Venereal Disease Control

**Highlights of a half century**

*PHS Publication No. 515. 1957. 11 pages. 10 cents.*

Significant events in the history of venereal disease control have been compiled in this pamphlet to provide a handy source of information for persons interested in this field. It also provides an extensive reference list.

## Traineeships for Nurses

*PHS Publication No. 520. 1957. Folder.*

This folder describes what the Professional Nurse Traineeship Program of the Public Health Service offers to graduate nurses interested in preparing for teaching, supervisory, or administrative positions. It outlines traineeship provisions, eligibility requirements, how awards are made, and when they can be used.

Training institutions where further information can be obtained or application can be made are listed.

## Ticks or Ixodides of the U.S.S.R.

*PHS Publication No. 548. 1957. By George Anastos. 397 pages.*

This comprehensive review of literature brings together into one volume and into the English language available information on ticks in the U.S.S.R.

Under each species information is presented concerning synonymy, geographic distribution and host distribution, hosts of the various stages, seasonal activity, habitat, life cycle, habits, control measures against the species, and parasites of the ticks and their relation to human and animal diseases. Where species of ticks are not endemic to Russia, limited information about their occurrence in other countries is included.

## Research Grants and Fellowships Awarded by the Public Health Service in 1956

*PHS Publication No. 532. 1957 98 pages. 30 cents.*

Research grants and fellowships awarded by the Public Health Service to non-Federal institutions and to individuals for support of research and training in medical and related sciences for the period July 1, 1955, through June 30, 1956, are listed in this annual report.

A preliminary statement explains briefly the entire awards program and summarizes the awards by the seven categorical institutes and the Division of Research Grants of the National Institutes of Health for fiscal 1956.

The listings are alphabetically arranged by State or country, institution, and investigator or fellow. Following the name of the investigator is a brief descriptive title of

the research, an identifying number which indicates the supporting institute, and the funds awarded for fiscal year 1956. Names of fellowship recipients are interspersed alphabetically among research investigators. The type of fellowship, the department of the institution in which the recipient holds his fellowship, and the sponsoring institute are indicated.

## Health Manpower Source Book

**Dental hygienists**

*PHS Publication No. 263, section 8. 1957. By Walter J. Pelton, Elliott H. Pennell, and Helen M. Varra. 87 pages; tables and charts. 50 cents.*

This first national inventory of the dental hygiene profession is designed to aid dental manpower planning programs by providing statistical information regarding current status and recent trends in supply and demand for hygienist's services.

In addition to a brief history of the profession, the source book includes information on number, location, and capacity of dental hygiene schools; age and school attended by students graduating in different years; the educational costs, residence, and planned practice locations for students currently in school. The development of State laws governing the practice of dental hygiene and current legal requirements for licensure are discussed.

The report presents data on geographic location, personal characteristics, employment status, and years of professional experience for a large group of dental hygienists who participated in a nationwide survey. Types of employment, hours worked, pay rates, and total earnings are analyzed for those currently active. Reasons given for retirement and plans for return to professional work are tabulated for those inactive at the time of the survey.

Survival ratios, by year of graduation, show the proportion licensed and proportion practicing in mid-1954. They reflect the impact of retirement on the service potential of dental hygienists.

## What is Past is Prologue

*Communicable Disease Center, PHS Publication. August 1957. 38 pages.*

This comprehensive progress report reviews the activities of the Health Services Training Section of the Communicable Disease Center's Training Branch since its establishment in 1955 to extend education and training services to physicians, veterinarians, nurses, record analysts, and others not previously served.

Personnel in State public health training programs, continued education activities of institutions of higher learning, and professional schools of the health sciences will find the report of special interest.

Single copies can be obtained by addressing the Chief, Communicable Disease Center, Public Health Service, 50 Seventh St., NE., Atlanta 23, Ga., Attention: Chief, Training Branch.

## How To Be a Nursing Aide in a Nursing Home

*PHS and American Nursing Home Association Publication (unnumbered). 213 pages; illustrated. $2.50.*

Clearly written and fully illustrated, this manual tells nursing home aides how to perform simple nursing procedures.

The introduction gives pointers on appearance, health, and conduct. There are 62 lessons, each consisting of three parts—a brief introduction, what to do, and a series of questions. Helping patients achieve self-care is emphasized.

The lessons include making a bed; helping with food service; helping a patient into a chair; helping with a bed bath; care for the hands, fingernails, and hair of a patient; helping a patient dress and undress; how to use a footrest; admitting and discharging a patient; care of equipment; taking temperature, pulse, and respiration; preventing bedsores; care for an incontinent patient; and care for a critically ill patient.

Copies can be ordered from The American Nursing Home Association, Hotel Bancroft, Springfield, Ohio.

## Cerebral Vascular Disease and Strokes

*PHS Publication No. 513. 1957. 15 pages; illustrated. 10 cents; $7.50 per 100.*

Designed to give the public understandable facts about cerebral vascular disease and to encourage hopeful and constructive attitudes toward this problem, this booklet is written in popular language and is simply illustrated.

It describes the cerebral vascular system, what it is and how it works, causes and effects of cerebral vascular disease, strokes (cerebral vascular accidents), prevention, how strokes strike, hope and help for people who have had strokes, treatment, and rehabilitation.

**WHOOPING COUGH.** *PHS Publication No. 220. (Health Information Series No. 60.) Revised 1957. 1-fold leaflet. $2 per 100.* Stresses the dangers of whooping cough and describes symptoms, communicability, prevention, and treatment of the disease.

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**This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.**

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# PUBLIC HEALTH REPORTS

Volume 72

*and*

## PUBLIC HEALTH MONOGRAPHS

# 1957 index

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

*Public Health Reports*, published since 1878 under authority of an act of Congress of April 29 of that year, is issued monthly by the Public Health Service pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220. Use of funds for printing this publication approved by the Director of the Bureau of the Budget, August 24, 1957.

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# PUBLIC HEALTH REPORTS

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
MARION B. FOLSOM, *Secretary*
PUBLIC HEALTH SERVICE
LEROY E. BURNEY, *Surgeon General*

THIS INDEX to *Public Health Reports* and Public Health Monographs is divided into a subject index and an author index.

The subject index carries one or more entries for each item published. In addition to the subject headings, categorical headings include ANNOUNCEMENTS (divided into EXAMINATIONS, ORGANIZATIONS, and PERSONNEL), CONFERENCE REPORTS, DEATHS, FILMS, FRONTISPIECES, GRANTS AND FELLOWSHIPS, LEGAL NOTES, PUBLICATIONS, PUBLIC HEALTH MONOGRAPHS, and TRAINING COURSES.

Public Health Monographs published concurrently with *Public Health Reports* in 1957 are listed in numerical order under that category heading. The monograph summaries appearing in the journal are indexed under appropriate subject headings.

One asterisk before the page number indicates an original, signed article. The sign of two asterisks, used only in the author index, indicates a monograph. Entries without any symbol may refer to summaries or briefs of papers presented at conferences, narrative conference reports, statements or reports of committees, short reports without authors, or similar items.

Illustrative material on the inside of the front cover of each issue is indexed by month under the heading FRONTISPIECES. It is recommended, therefore, that the covers be included in a bound volume.

A compiled annual list of Public Health Service publications may be obtained from the Public Inquiries Branch, Office of Information.

**Key to Dates and Pages**

# Subject Index



*Original article.

# Author Index



* Original article ** Public Health Monographs

## CORRECTIONS

MARCH, p. 243, 2d column, lines 15 and 16, in the report entitled "Periodontium Not Injured by Use of Fluoride Water," a summary of a paper by Dr. Albert L. Russell, the figures should be reversed so that the text reads: "One of the comparisons was between 379 adults . . . in Colorado Springs . . . and 144 adults . . . in Boulder . . . Colo."

FEBRUARY, p. 167, 1st column, in the article entitled "Smallpox Control by Mass Vaccination With Dried Vaccine," by Harald Frederiksen and James P. Sheehy, this statement appears: " . . . yet it [dried vaccine] has been systematically produced and used on a large scale only in one country, Indonesia." A correspondent reports that the product is also produced in Saigon, Viet Nam. The embassy of that country informs us that "dried vaccine against smallpox has been produced at the Pasteur Institute in Saigon since 1925, and the average annual production is 9,000,000 doses."



U. S. GOVERNMENT PRINTING OFFICE: 1958